

Service Manual

Audio Traveller AA222



***Part number 80653110
Valid from serial 899714***

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General Technical Specifications

Medical CE-mark:	The CE-mark indicates that Interacoustics A/S meets the requirements of Annex II of the Medical Device Directive 93/42/EEC. Approval of the quality system is made by TÜV – identification no. 0123.	
Standards:	Safety:	EN 60601-1, Class I, Type B
	EMC:	EN 60601-1-2
	Impedance:	EN 61027/ANSI S3.39, Type 2
	Audiometer:	EN 60645-1/ANSI S3.6 , Tone: Type 2, Speech Type B-E
Power, UPS400:	Consumption:	15 W (Max 60W) – see separate Service Manual
	Mains voltages and fuses:	T1 A
Operation environment:	Temperature:	15 – 35 °C
	Rel. Humidity:	30 – 90%
Storing/handling:	Temperatures below 0°C and above 50°C may cause permanent damage on the instrument and its accessories.	
Warm up time:	10 minutes at room temperature (20 °C).	

Impedance Measuring System

Probe tone:	Frequency:	226 Hz
	Level:	85 dB SPL with AGC, assuring constant level at different volume.
Air pressure:	Control:	Automatic.
	Indicator:	Measured value is displayed on the graphical display.
	Range:	-600 to +300 daPa.
	Pressure limitation:	-800 daPa and +600 daPa.
	Pressure change rate:	Minimum (50 daPa/s), medium, maximum or automatic with minimum speed at compliance peak. Selectable in the set-up.
Compliance:	Range:	0.1 to 6.0 ml (Ear volume: 0.1 to 8.0 ml).
Test types:	Tympanometry	Automatic, where the start and stop pressure can be user-programmed in the set-up function.
	Eustachian Tube Function	Williams test (automatic function).
Indicators:	Graphical display	Compliance is indicated as ml and pressure as daPa. Stimulus level is indicated as dB Hearing Level.
Memory:	Tympanometry:	1 curve per ear.
	Eustachian Tube Function:	3 curves per ear.

Reflex and Audiometer Functions

Signal sources:	Tone - Contra, Reflex:	250, 500, 1000, 2000, 3000, 4000, 6000, 8000 Hz.
	Tone , Audiometry:	125, 250, 500, 750, 1000, 1500, 2000, 3000, 4000, 6000, 8000 HZ.
	Tone - Ipsi, Reflex:	500, 1000, 2000, 3000, 4000 Hz.
	Noise - Contra, Reflex:	Wide Band, High Pass, Low Pass.
	Noise - Ipsi, Reflex:	Wide Band, High Pass, Low Pass.
	Masking	Narrow Band Noise, in 11 bands White Noise Speech Noise
Inputs:	CD1/2	Connection for CD or tape player
	Mic.	Connection for external microphone for live speech
	Talk Back	Connection for talk back microphone. Level adjustment by entering <shift>+<CD1/2> (keep it down in a while).
	Patient Response:	Connection for patient response switch. Response indication in the display when activated
Outputs:	Earphone Right/Left	Can be selected to be either standard earphones or insert phones by pressing <i>shift</i> Right/Left. Speech output can be selected as electrically linear (type B) or free field equivalent (Type B-E) using TDH39.
	Free Field 1 and 2	Electrical outputs for external 2 channel power amplifier (AP12 or AP70).
	Monitor	Monitor earphone disconnects the internal monitor loudspeaker when inserted. Operator can monitor the signal when presented to the patient as well as the talk back signal from patient's microphone.
	Contra Earphone:	TDH39 or insert phones for Reflex If selected Connection for CIR22/CIR33 for masking.
	Ipsi Earphone:	Probe earphone incorporated in the probe system for Reflex measurements.
	Bone Conductor	Masking in right or left earphone can be selected
	Air:	Connection of the air system to the probe.
	USB:	Input/output for computer communication. An external PC can be made to both monitor and control the instrument. The control

		actions can be followed on the display and operation panel. Online communication can be selected, where the measured data will be sent to an external PC. See separate section in Service Manual for programming details. Connection for external keyboard, standard PC type. Connection for external printer using HP PCL L3
Patient Communication	Keyboard: Printer: Talk Forward	Operator to patient communication. 10-110dB continuously adjustable on the operation panel
Attenuator:	Range:	0 to 130 dB in 1 or 5 dB steps. Typical range is –10 to 120 dB HL. Range is individual for different modes- see table 1. The upper 20dB is accessed by pressing the ext. Range button
Tone Switch:		Silent touch switch for soft presentation of signals. Tone indication in the display
Tone Presentation:	Manual: Reverse: Pulse:	Tone is presented by activation of Tone Switch. Tone is interrupted by activation of Tone Switch. Single pulse or automatic pulsing with selectable on/off times of 250 – 5000ms.
Auto Threshold:		Patient controlled Hughson-Westlake test according to ISO 8253-1 with automatic storing of the threshold values in the internal memory. Patient response is open for 2 seconds after signal presentation. 2 out of 3 or 3 out of 5 correct responses can be selected.
Test Types:	Manual Audiometry Automatic Audiometry Manual Reflex Reflex Decay: SISI Warble Stenger ABLB	Manual control of all functions. Auto threshold according to ISO 8253-1 (Patient controlled Hughson-Westlake). The threshold is determined by the activation of the patient response. Manual control of all functions. Manually controlled with stimulus duration of 10 s. With automatic score calculation (5dB included for familiarisation) 5 Hz sine, ±5% modulation Binaural pure tone or speech stimulation Automatic loudness balance test (Fowler)
Memory:		6 ipsi and 6 contra graphs/curves. Each can have up to 6 pulses. There is additional capacity for 6 manual tests. When activated, the displayed values for AC L/R, BC L/R or FF1 and 2 are stored in the internal memory. Stored values can be printed out on a printer if connected
Synchronous Masking Channel 2 Options		Locks Channel 2 attenuator to Channel 1 attenuator Output of Channel 2 can be set up to be either Narrow Band or White Noise
Speech Level Indicator:		A signal level of 0 dB on the VU meter indicates that the output to the selected transducer is calibrated.
Printer (Optional)	Type Paper with Printing time	Thermal printer with recording paper in rolls 112mm 26s for worst case (2 tympanograms + 16 reflexes + 2 tone + 2 Speech audiograms)

Table 1 Reflex Frequencies and intensity ranges

Frequency	Reflex							
	Contralateral						Ipsilateral	
	TDH39		EAR-Tone 3A		Insert/CIR22/CIR33			
	Min	Max*	Min	Max*	Min	Max*	Min	Max*
Hz	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL
250	-10	110	-10	105	0	100	-	-
500	-10	120	-10	110	0	105	10	105
1000	-10	120	-10	120	0	110	10	110
2000	-10	120	-10	120	0	105	10	105
3000	-10	120	-10	120	0	100	10	100
4000	-10	120	-10	115	0	95	10	100
6000	-10	120	-10	100	-	-	-	-
8000	-10	110	-10	95	-	-	-	-
WB noise	-10	120	-10	120	0	100	10	105
LP noise	-10	120	-10	120	0	100	10	105
HP noise	-10	120	-10	120	0	100	10	105

Note: Max values are obtainable by selecting "Ext. Range" in the instrument.

Table 2 Audiometry Frequencies and intensity ranges

Frequency		Audiometry								
	TDH39		EAR-Tone 3A		Bone conduction B71		Insert Masking NB		Free Field	
	Min	Max*	Min	Max*	Min	Max*	Min	Max*	Min	Max*
Hz	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL	dB HL
125	-10	90	-10	90	-	--	-	-	-10	80
250	-10	110	-10	105	0	45	0	105	-10	90
500	-10	120	-10	110	0	65	0	110	-10	100
750	-10	120	-10	115	0	70	0	110	-10	100
1000	-10	120	-10	120	0	70	0	110	-10	100
1500	-10	120	-10	120	0	70	0	110	-10	100
2000	-10	120	-10	120	0	75	0	110	-10	100
3000	-10	120	-10	120	0	80	0	110	-10	100
4000	-10	120	-10	115	0	80	0	105	-10	100
6000	-10	120	-10	100	0	55	0	95	-10	95
8000	-10	110	-10	95	0	50	0	90	-10	90

Speech	Type B	-10	100	-10	90	-10	50	-	-	0	100
	Type B-E	-10	110	-10	90	-10	50	-	-	0	100
Speech Noise	Type B	-10	100	-10	90	-	-	0	90	0	90
	Type B-E	-10	110	-10	90	-	-	0	90	0	90

Note: Max values are obtainable by selecting "Ext. Range" on the instrument.

Other configuration of the intensity range can be chosen by use of the Service Software.

Specification of input/output connections

Inputs	Connector type	Electrical properties	
Power UPS400	DIN, 5 pole	Pin 1 and 2 Pin 3: Pin 4: Pin 5:	0V +5V -12V +12V
Patient response	Jack, 6.3mm stereo	Handheld switch:	5V through 10k Ω is forced to gnd. level when activated.
CD 1 and 2	Phono	Sensitivity: Impedance: Freq. Response:	9 mV at max volume and 0 Vu 47.5 k Ω 75-12000 Hz $\pm$ 3dB
Microphone	Jack, 6,3 mm stereo	Type: Sensitivity: Impedance: Freq.Response: Electret bias:	Electret or 2000 Ω dynamic microphone. 100 μ V at max volume for 0 Vu reading 47.5 k Ω 90-20kHz 6.2V through 4.75 k Ω (1.3 mA)
Talk Back microphone	Jack, 6,3 mm stereo	As for Microphone	
Keyboard	DIN, 5 pole	Pin 1: Pin 2: (Grey) Pin 3: (Violet) Pin 4: (White) Pin 5: (Black)	NC RXA1 Sync clk. VDD, 5V Gnd.
Outputs:			
Phones, Left/ Right	Jack, 6.3mm mono	Voltage: Min. load impedance:	Up to 5.5V rms. by 10 Ω load 5 Ω
Bone conductor	Jack, 6.3mm mono	As for Phones, Left/Right	
Free Field 1, 2	Phono	Voltage: Min. load impedance:	Up to 8.0V rms. by 100 Ω load 100 Ω
Monitor	Jack, 6.3mm mono	Voltage: Min. load impedance:	Up to 2.0V rms. by 8 Ω load 0 Ω
Phones, Contralateral (Insert masking)	Jack, 6.3mm mono	Voltage: Min. load impedance:	Up to 5.5V rms. by 10 Ω load 5 Ω
Transducer	CANON, 15 pole	Pin 1: Pin 2: Pin 3: Pin 4: Pin 5: Pin 6: Pin 7: Pin 8: Pin 9: Pin 10: Pin 11: Pin 12: Pin 13: Pin 14: Pin 15:	Press. 1 signal 12V -12V Remote key/detection Probe tone Mic. signal LED blue Press. 2 signal LED green Ipsi Stim. Gnd. Ipsi Stim. Signal Probe tone Gnd. Gnd. Vref., 5V LED red
Data I/O:			
USB	USB type"B"	USB port for communication	See appendix A in service manual for detailed information

Other electrical specification:

VU meter: True r.m.s. measurement
 Warble: 5 Hz sine, $\pm$ 5% modulation

Calibration properties

Calibrated Transducers:	Contralateral Earphone:	Telephonics TDH39 with a static force of 4.5N $\pm$ 0.5N
	Probe system:	Ipsilateral Earphone: is integrated in the probe system 226 Hz transmitter and receiver and pressure transducer is integrated in the probe system
Accuracy:	Audiometry headset:	Telephonics TDH39 with a static force of 4.5N $\pm$ 0.5N
	Bone conductor:	Radioear B71 with a static force of 5.4N $\pm$ 0.5N
	Insert phones:	E·A·R Tone 3A (Option)
	Insert masking phone:	CIR22/CIR33 (Option)
	General	Generally the instrument is made and calibrated to be within and better than the tolerances required in the specified standards:
	Audiometer and Reflex Frequencies:	$\pm$ 1%
	Contralateral Reflex and Audiometer Tone Levels:	$\pm$ 3 dB for 125 to 4000Hz and $\pm$ 5 dB for 6000 to 8000Hz
	Speech frequency response:	-0/-10 dB at 125 – 249 Hz $\pm$ 3 dB for 250 – 4000 Hz $\pm$ 5 dB for 4001 – 6300 Hz
	Ipsilateral Reflex Tone Levels:	$\pm$ 5 dB for 500 to 2000Hz and +5/-10 dB for 3000 to 4000Hz
	Pressure measurement :	$\pm$ 5% or $\pm$ 10 daPa, whichever is greater
	Compliance measurement:	$\pm$ 5% or $\pm$ 0.1 ml, whichever is greater

Impedance calibration properties

Probe tone	Frequency:	226 Hz $\pm$ 1%
	Level:	85 dB SPL $\pm$ 1.5 dB measured in an IEC 126 acoustic coupler. The level is constant for all volumes in the measurement range.
Compliance	Distortion:	Max 5% THD
	Range:	0.1 to 6.0 ml
	Temperature dependence:	-0.003 ml/ $^{\circ}$ C
	Pressure dependence:	-0.00020 ml/daPa
	Reflex sensitivity:	0.001 ml is the lowest detectable volume change
	Temporal reflex characteristics:	Initial latency = 10 ms ($\pm$ 5 ms) Rise time = 75 ms ($\pm$ 5 ms) Terminal latency = 10ms ($\pm$ 5 ms) Fall time = 75 ms ($\pm$ 5 ms) Overshoot = max. 8% Undershoot = max 10%
Pressure	Range:	Values between -600 to +300 daPa can be selected in the set-up.
	Safety limits:	-700 daPa and +500 daPa, $\pm$ 100 daPa

Reflex/audiometer calibration standards and spectral properties:

General	Specifications for stimulus and audiometer signals are made to follow EN 60645-1	
Contralateral Earphone	Pure tone:	ISO 389-1 for TDH39.
	Wide Band noise (WB):	Interacoustics Standard
	– Spectral properties:	As “Broad band noise” specified in EN 61027, but with 500 Hz as lower cut-off frequency.
	Low Pass noise (LP):	Interacoustics Standard
	– Spectral properties:	Uniform from 500 Hz to 1600 Hz, $\pm$ 5 dB re. 1000 Hz level
	High Pass noise (HP):	Interacoustics Standard
	– Spectral properties:	Uniform from 1600 Hz to 10KHz, $\pm$ 5 dB re. 1000 Hz level
	Ipsilateral Earphone	
	Pure tone:	Interacoustics Standard.
	Wide Band noise (WB):	Interacoustics Standard
Ipsilateral Earphone	– Spectral properties:	As “Broad band noise” specified in EN 61027, but with 500 Hz as lower cut-off frequency.
	Low Pass noise (LP):	Interacoustics Standard
	– Spectral properties:	Uniform from 500 Hz to 1600 Hz, $\pm$ 10 dB re. 1000 Hz level
	High Pass noise (HP):	Interacoustics Standard
	– Spectral properties:	Uniform from 1600 Hz to 4000 Hz, $\pm$ 10 dB re. 1000 Hz level
	General about levels:	The actual sound pressure level at the eardrum will depend on the volume of the ear. See Table 4 for details.
	Pure tone:	ISO 389-1/ ANSI S3.6 for TDH39.
	Narrow band noise:	ISO 389-1 / ANSI S3.6 + ISO 389-4 values
	– Spectral properties:	EN 60645-1, Narrow band noise
Earphones	White noise:	SPL
	– Spectral properties:	EN 60645-1, White noise

Bone conductor	Pure tone:	ISO 389-3 / ANSI S3.6. Valid for placement on the human mastoid
Insert phones	Pure tone:	ISO 389-2
	Narrow band noise:	ISO 389-2+ ISO 389-4 values
	– Spectral properties:	EN 60645-1, Narrow band noise, electrically measured.
	White noise:	SPL
Insert masking phone	– Spectral properties:	EN 60645-1, White noise, electrically measured.
	Narrow band noise:	ISO 389-2 + ISO 389-4 values
	– Spectral properties:	EN 60645-1, Narrow-band noise, electrically measured.
	White noise:	SPL
Free Field output (calibrated on location)	– Spectral properties:	EN 60645-1, White noise, electrically measured.
	Pure tone:	ISO 389-7 Free field
	Narrow band:	ISO 389-7 Diffuse field
	– Spectral properties:	EN 60645-1, Narrow band noise
	White noise:	SPL
	– Spectral properties:	EN 60645-1, White noise.
Speech calibration standards and spectral properties:		
Earphones	Speech signal ¹ :	EN 60645-2/ANSI S3.6, type B,B-E, or STAFF
	Speech weighted masking:	EN 60645-2/ANSI S3.6, type B,B-E, or STAFF
		EN 60645-2, type B or B-E masking sound
	– Spectral properties:	
Bone conductor	Speech signal:	EN 60645-2
	– Spectral properties:	EN 60645-2, electrically measured.
Insert phones	Speech signal:	EN 60645-2, type B
	Speech weighted masking:	EN 60645-2, type B
		EN 60645-2. Masking sound, uncorrected, electrically measured.
	– Spectral properties:	
Insert masking phone	Speech weighted masking:	EN 60645-2, type B
		EN 60645-2.Masking sound, uncorrected, electrically measured.
	– Spectral properties:	
Free field output	Speech signal:	EN 60645-2, ANSI S3.6 or STAFF
	Speech weighted masking:	EN 60645-2, ANSI S3.6 or STAFF
		EN 60645-2 Masking sound
	– Spectral properties:	

¹ The speech calibration signal recommended by EN 60645-2, type B-E-calibration, can be track 32 from Westra CD no. 1.
By calibration of ANSI and EN 60645-2, type B a 1000Hz sine tone is used.

Table 3

Freq [Hz]	Reference values for stimulus and audiometer calibration										
	ISO 389-1 (TDH39)	ANSI S3.6 (TDH39)	ISO 389-4 (ISO 8798) (NB masking)	ISO 389-3 (ISO 7566) (BC)	ANSI S3.6 (BC)	ISO 389-2 (Insert)	ISO 389-7 Free field (FF)	ISO 389-7 Diffuse-field (FF)	Interacoustics Standard		
	[dB re. 20 µPa]	[dB re. 20 µPa]	[dB re. 20 µPa]	[dB re. 1µN]	[dB re. 1µN]	[dB re. 20 µPa]	[dB re. 20 µPa]	[dB re. 20 µPa]	TDH39	Insert	Ipsi
125	45,0	45	4			26	22,0	22,0			
250	25,5	25,5	4	67	67	14	11,0	11,0			
500	11,5	11,5	4	58	58	5,5	4,0	3,5			
750	7,5	8	5	48,5	48,5	2	2,0	1,0			
1000	7	7	6	42,5	42,5	0	2,0	0,5			
1500	6,5	6,5	6	36,5	36,5	2	0,5	-1,0			
2000	9	9	6	31	31	3	-1,5	-1,5			
3000	10	10	6	30	30	3,5	-6,0	-4,0			
4000	9,5	9,5	5	35,5	35,5	5,5	-6,5	-5,0			
6000	15,5	15,5	5	40		2	2,5	-0,5			
8000	13	13	5	40		0	11,5	5,5			
WB									-8	-5	-5
LP									-6	-7	-7
HP									-10	-8	-8

Survey of speech reference values							
		EN 60645-2		ANSI S3.6		STAF 1996	
		Type A/B	Type A/B-E	Type A/B/C	Type A/B/C-E	Type A/B	Type A/B-E
		[dB]	[dB]	[dB]	[dB]	[dB]	[dB]
Earphones (IEC 303 coupler)	Calibration signal	20	0 or 3,8*	19,5	19,5	22	NS(0)
	Speech weighted masking	20	0 or 3,8*	19,5	19,5	27	NS(0)
Bone conductor (IEC 373 coupler)	Calibration signal	55	NS(55)	55	NS(55)	NS(55)	NS(55)
	Speech weighted masking	55	NS(55)	55	NS(55)	NS(55)	NS(55)
Loudspeaker	Calibration signal	20	0	14,5	14,5	0	NS(0)
	Speech weighted masking	20	0	14,5	14,5	0	NS(0)
Insert phones (IEC 126 coupler)	Calibration signal	20	NS(20)	12,5	NS(12,5)	21	NS(21)
	Speech weighted masking	20	NS(20)	12,5	NS(12,5)	NS(26)	NS(26)
Insert masking phone (IEC 126 coupler)							
	Speech weighted masking	20	NS(20)	12,5	NS(12,5)	NS(26)	NS(26)

NS = Not Standardised. Values in brackets are used by factory calibration.

* = Values for Germany

Table 4

Freq.	Variation of ipsi stimulus levels for different volumes of the ear canal	
	Relative to the calibration performed on an IEC 126 coupler	
	0.5 ml	1 ml
[Hz]	[dB]	[dB]
500	9.7	5.3
1000	9.7	5.3
2000	11.7	3.9
3000	-0.8	-0.5
4000	-1.6	-0.8
WB	7.5	3.2
LP	8.0	3.6
HP	3.9	1.4

Coupler types used by calibration

- TDH39 is calibrated using a 6cc acoustic coupler made in accordance to IEC 303
- Insert phones are calibrated using a 2cc acoustic coupler made in accordance to IEC 126
- Bone Conductor is calibrated using a mechanical coupler made in accordance to IEC 373

General properties for earphones

Sound attenuation values for earphones		
Frequency	Attenuation	
	TDH39 with MX41/AR or PN 51 cushion	EAR-Tone 3A
[Hz]	[dB]	[dB]
125	3	32.5
160	4	-
200	5	-
250	5	36
315	5	-
400	6	-
500	7	37.5

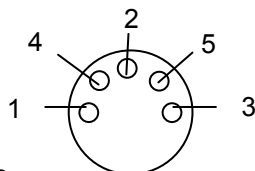
Difference between free field and coupler sensitivity levels. Used by Free Field equivalent earphone output (Type A-E or B-E)	
Frequency	Correction values
	TDH39 with MX41/AR or PN 51 cushion using IEC 303 coupler
[Hz]	[dB]
125	-17.5
160	-14.5
200	-12
250	-9.5
315	-6.5
400	-3.5
500	-0.5

630	9	-
750	-	-
800	11	-
1000	15	36.5
1250	18	-
1500	-	-
1600	21	-
2000	26	33
2500	28	-
3000	-	-
3150	31	-
4000	32	39.5
5000	29	-
6000	-	-
6300	26	-
8000	24	42.5

630	0
750	-
800	-0.5
1000	-0.5
1250	-1
1500	-
1600	-4
2000	-6
2500	-7
3000	-
3150	-10.5
4000	-10.5
5000	-11
6000	-
6300	-10.5
8000	1.5

Output voltages (regulated):

Pin no.	Voltage	Cont. current A	Peak current A
1	Gnd.	-	-
2	Gnd.	-	-
3	+5	0.5	1.0
4	-12	0.7	3.0
5	+12	0.5	1.5



View on output pins

General about Specifications

Interacoustics continuously strive to improve the products and their performance. Therefore the specifications can be subject to change without notice.

The performance and specifications of the instrument can only be guaranteed if it is subject to a technical maintenance at least once a year. This should be made by a workshop, authorized by Interacoustics.

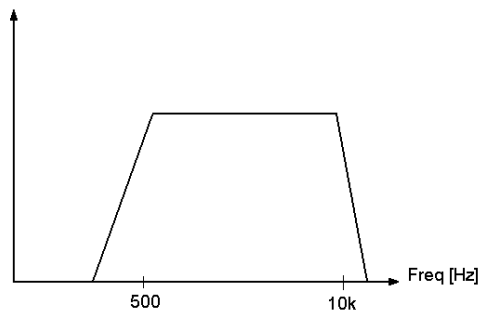
Questions about representatives and products may be sent to:

Interacoustics A/S	Phone: +45 63713555
Drejervaenget 8	Fax: +45 63713522
DK 5610 Assens	email: info@interacoustics.com
Denmark	www.interacoustics.com

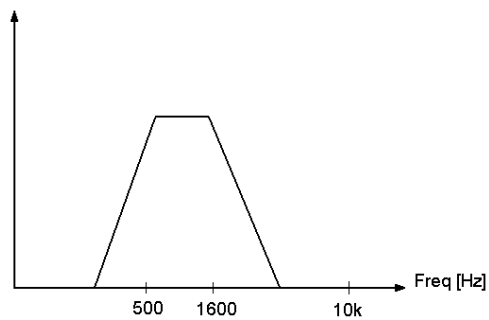
Noise characteristics

Wide band noise (WB), low pass noise (LP) and high pass noise is use for reflex stimuli. And wide noise (WN) is used for masking.

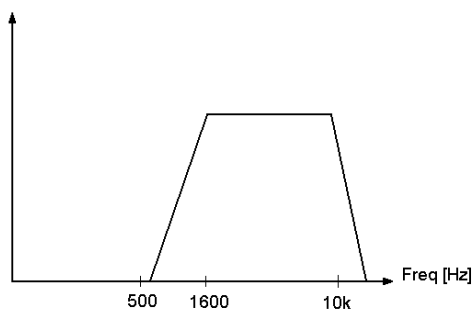
WB (500Hz high pass filter):



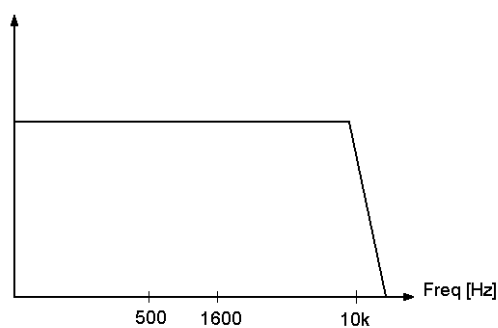
LP (500-1600Hz band pass filter):



HP (1600 - 10kHz band pass filter):



WN (0 - 10kHz low pass filter):



Calibration Procedure

General Information

Service, Adjustment and Repair

This instrument can be serviced, adjusted and repaired without losing the validity of the CE-marking provided the measuring equipment used is fulfilling the demands below, the adjustment procedure are followed and the personnel is having the necessary qualifications approved by Interacoustics.

Before any kind of the calibration can take place, the AA222 must have been on power for at least 3-5 minutes in a normal temperature milieu, and the instrument must be in the same milieu for a reasonable time.

While keeping <shift> and <Print> buttons down, switch power on at the rear panel of the instrument. By use of the F keys enter password: 1 2 3 4 . The AA222 is now in software calibration menu.

If a printer is connected to the instrument is it possible to get a complete detailed description of the instrument set-up. While keeping <shift> and <Store> buttons down, switch power on at the rear panel of the instrument.

The AA222 has to kinds of calibration: hardware and software calibration. The software calibration can be done without opening the instrument. When the instrument has been hardware calibrated, it must be followed by a software calibration.

Equipment for the Calibration

In order to assure correct calibration of the audiometric equipment, it is important that the necessary measuring equipment is used and that it is reliable and stable.

Minimum requirements for measuring equipment:

- Measuring amplifier with input for condenser microphone or a sound level meter, fulfilling the demands of IEC 651 Type 1.
- Acoustics coupler, 6cc and 2cc fulfilling the demand of IEC 303 and IEC 126.
- 1" pressure field condenser microphone for the above-mentioned couplers, fulfilling the demands of the IEC 1094-1.
- Manometer with a range from at least +300 to – 600 daPa and a accuracy of $\pm 5\%$ of reading or ± 5 daPa which ever is the greatest. Including a syringe (manual pump).
- The CAT40 calibration cavities (0.5, 2.0 and 5.0 ml)
- It is recommended to have an acoustic calibrator for the control of the complete measuring chain
- General purpose frequency counter
- General purpose digital multimeter
- General purpose oscilloscope in order to trace and monitor signals

Air System

The safety valves and the pump system are adjusted in correct way from factory. Normally it should not be adjusted, but if the pump tube has to be exchanged it is necessary to readjust the spring on the pump. Please always use pre-cutted pump tubes ordered from Interacoustics.

Control of the pump system:

Go to Calibration > Probe > Press > Real menu. Place the probe into a cavity (airtight connection). Press the → button (F2) until you reached +300 daPa in the "Pump Ctrl" field on the display. If the build-up pressure keep at 300 daPa the system is airtight.

If the instrument is out of calibration you can connect an external manometer and a syringe between the air connection on the rear plate and the probe tube. Press the syringe until +300 daPa is reached and inspect the manometer. If the pressure is stable the system is airtight.

Safety valve:

The safety valve must release the pressure then the pressure is out of limit. It means if the pressure is larger than +500 daPa (± 100 daPa) or if the pressure is larger than -700 daPa (± 100 daPa).

Adjustment of the pump spring:

Disconnect the probe tube from the air connection on the rear plate. Connect a manometer and a syringe between the air connection and the probe tube. Go to Calibration > Probe > Press > Real menu. Place the probe into a cavity (airtight connection). Press the → button until +400 daPa is reached and inspect the manometer. Adjust the spring until the pressure decrease very slow down. Pump again until +400 daPa is reached. Inspect the manometer and if the pressure is stable or decrease very slow the adjustment is fine, else turn the screw clockwise until the manometer is stable. Repeat the pump procedure again and inspect the manometer for stable pressure. Repeat this until the pressure is stable. Now the spring is correct adjusted.

Before the contra nut is fastened the screw has to be turned three times clockwise to be sure that the system is and will stay airtight.

Hardware Calibration

To enter the calibration menus please switch off power – hold down shift while pressing Print key – turn on power again. Hold the keys down until you can enter a password. The factory setting of the password is 1 2 3 4, but dealer may have changed it in order to protect the calibration. If an EEPROM Error occurs during the power up, press shift + print to continue to the password screen.

Note! The hardware calibration is normally only done once in the instrument lifetime and at the factory.

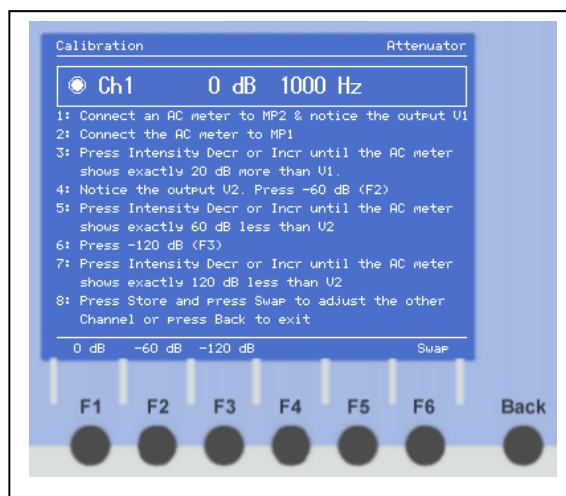
Measuring points (**MP**) refers to Main board Index page 40

Measurements are made with reference to MP13, MP4 and MP15 (GND)

Attenuator Calibration

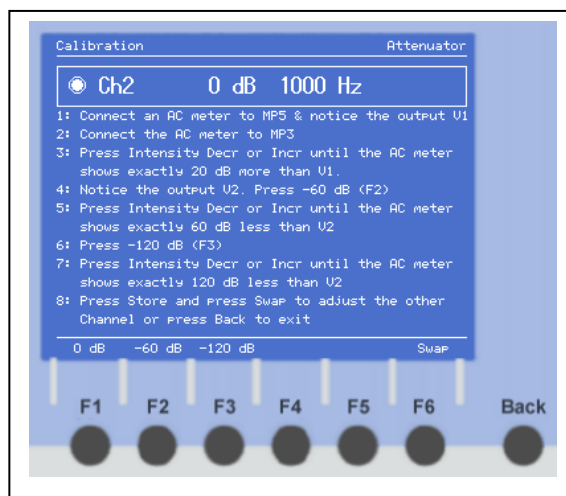
Enter the Attenuator Calibration menu from the Calibration menu by pressing F5 – “Att”.

This is the calibration picture for channel 1.



Attenuator Calibration channel 1. Figure 1

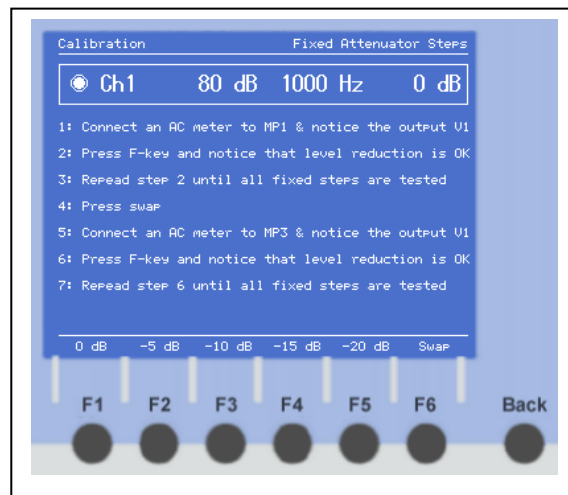
Change to Channel 2 by pressing Swap (F6) in order to calibrate channel 2.



Attenuator Calibration channel 2. Figure 2

Fixed Attenuator Check

Enter the Fixed Attenuator Check menu from the Calibration menu by pressing F6 – “Fixed”.



Attenuator Calibration. Figure 3

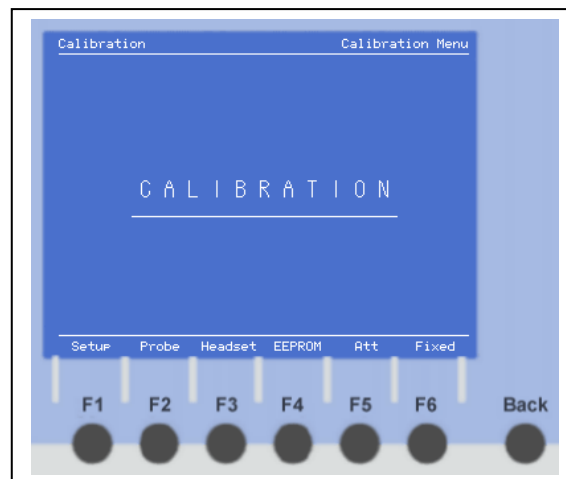
Follow the instructions on the screen.

Software Calibration

A software calibration must always be performed when the instrument has been opened for hardware calibration or if an EEPROM error has occurred.

The calibration is a service calibration, which means, that if the instrument has changed its values during time or because of manual chock, corrections for moderate changes in the software can be made by means of the figures in the EEPROM.

To enter the calibration menus please switch off power – hold down shift while pressing Print key – turn on power again. Hold the keys down until you can enter a password. The factory setting of the password is 1 2 3 4, but dealer may have changed it in order to protect the calibration.



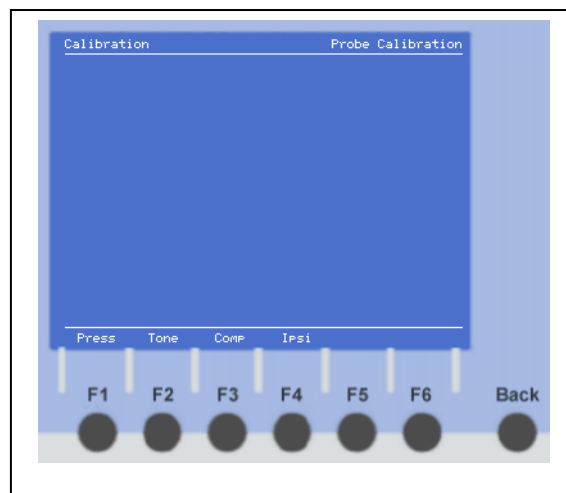
The Calibration Menu. Figure 4

Notice!

For calibration of the Universal Transducer for both types of probetips, you must carry out the probe calibration twice. Repeat pages 17-21 after switching probe tip.

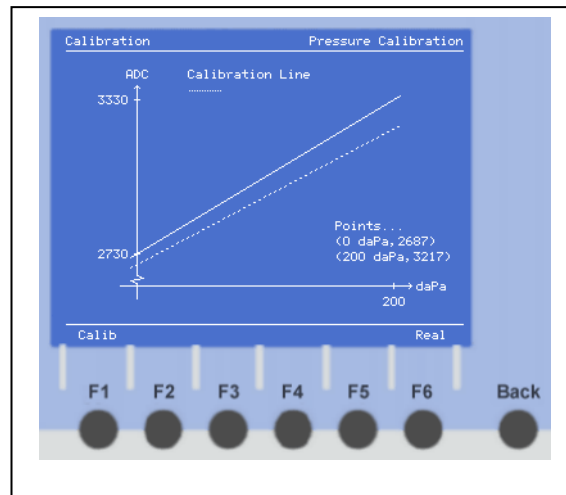
Probe Calibration

To enter this menu from the Calibration Menu Press "Probe" (F2).



Probe Calibration Menu. Figure 5

Pressure Calibration



Pressure Calibration. Figure 6

Looking at the picture you will see two lines (if the instrument is calibrated) in a diagram. The dotted line is the calibration line that graphically gives you information regarding the calibration of the pressure. The normal line is an average line and by comparing the two lines you can get quick overview of the pressure calibration. You can also read the actual ADC values under Points if necessary.

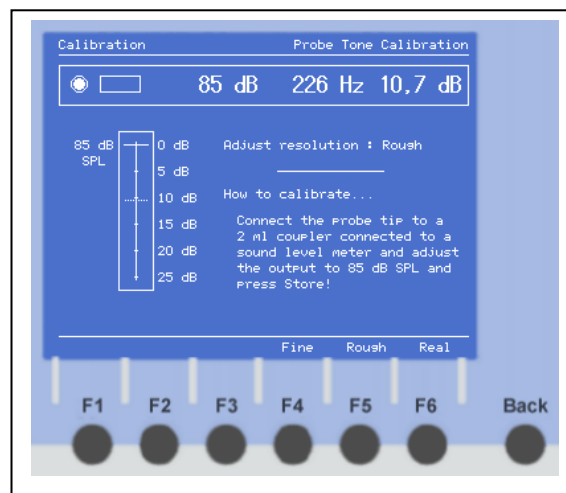
To Calibrate Pressure System

Press Calib (F1) and follow the instructions on the screen.

To Test the Probe Calibration

If the probe is calibrated you can test the calibration among other things in the "Probe Real Mode". Select Real (F6) to enter this menu.

Probe Tone Calibration



Probe Tone Calibration Figure 7

This is the menu for calibration of the different probe tones. The dotted line in the bar shows the adjustment level.

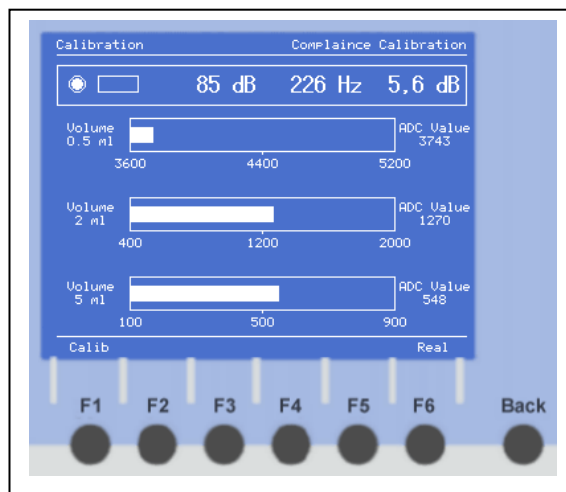
To Calibrate Probe Tone levels

Follow instructions on the screen.

Fine (F4) and Rough (F5)

Fine and Rough gives the resolution of the steps when adjusting the probe tone level. You can see what resolution that is selected when looking at "Adjust Resolution" at the display. Selecting Fine the resolution will be 0,1 dB and selecting Rough the resolution will be 0,5 dB.

Compliance Calibration



Compliance Calibration. Figure 8

Entering this menu you need to confirm that the Probe Tone is calibrated correctly (see Probe Tone Calibration). If not press Exit (F6) and go through the procedures of Pressure Calibration and Probe Tone Calibration.

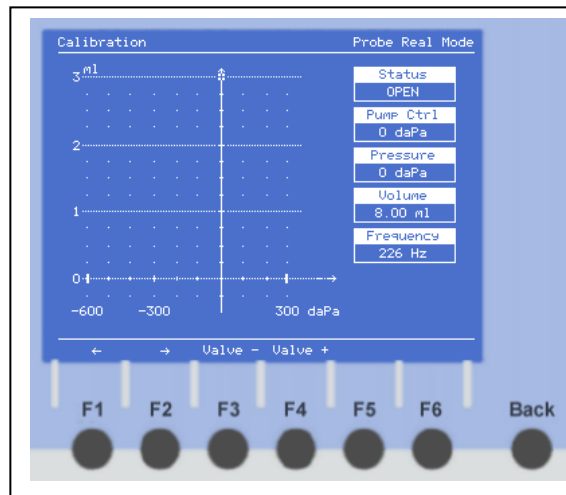
To Calibrate Compliance System

Press Calib (F1) and follow the instructions on the screen.

To Test the Probe Calibration

If the probe is calibrated you can test the calibration among other things in the "Probe Real Mode". Select Real (F6) to enter this menu.

Probe Real Mode



Probe Real Mode Figure 9

This menu is designed for testing the calibration of the Probe system and the pressure safety valves.

Manually pump control

Use F1 or F2 to change "Pump Control" (status window to the right) until it shows the described pump pressure. Notice the "Pressure" status window below.

Safety valve test

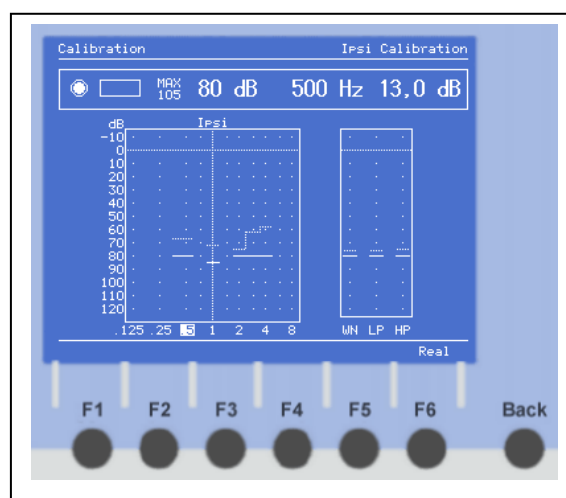
The safety valve in the pressure system is designed with -800 daPa as minimum and +600 daPa as maximum limits for pump pressure (normal pressure range is -600 to 300 daPa). Note! The safety valve may release before limits.

Connect a manometer to the pressure system that can measure pressures from -800 daPa to +600 daPa.

Press "Valve -" (F3) until the manometer stops its movement. Notice the pressure and if the pressure lies within -800 and -650 daPa the valve works properly.

Press "Valve +" (F4) until the manometer stops its movement. Notice the pressure and if the pressure lies within +350 and +600 daPa the valve works properly.

Ipsi Calibration



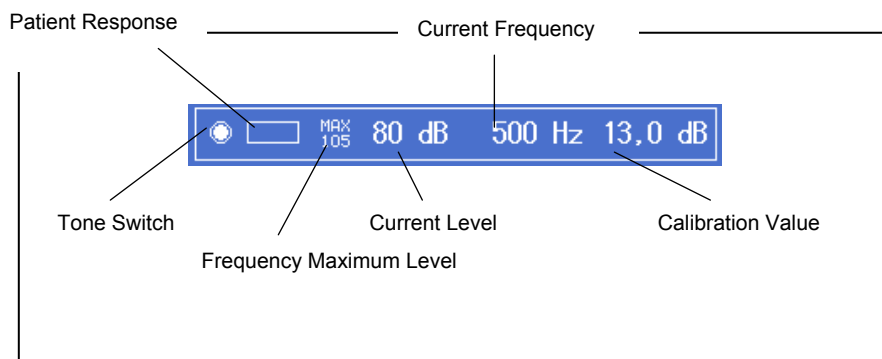
Ipsi Calibration Menu. Figure 10

This is the ipsi calibration menu.

In the audiogram in the screen picture you can see the calibration of the ipsi transducer and the calibration level by looking at lines. The dotted lines are the calibration values drawn with offset in the calibration level (normal line). Above the audiogram we have an information window.

The information window

The information window contains information that can be helpful working with the calibration. The figure below shows what kind of information that is displayed.



Information Window. Figure 11

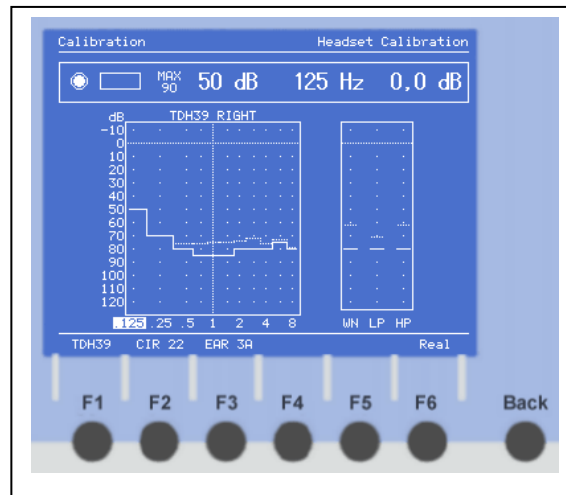
How to calibrate...

1. Select by means of frequency increase/decrease the frequency to be calibrated or start to calibrate the pre-selected frequency.
2. Press intensity increase/decrease for channel 1 until the desired sound pressure level has been achieved.
3. Press store. The instrument will automatically jump to the next frequency.
4. Continue to calibrate the new frequency or select another.

To Test the Ipsi Calibration

When done with the ipsi calibration you can enter the "Ipsi Real Mode" to test the calibration. Select Real (F6) to enter this menu.

Headset Calibration



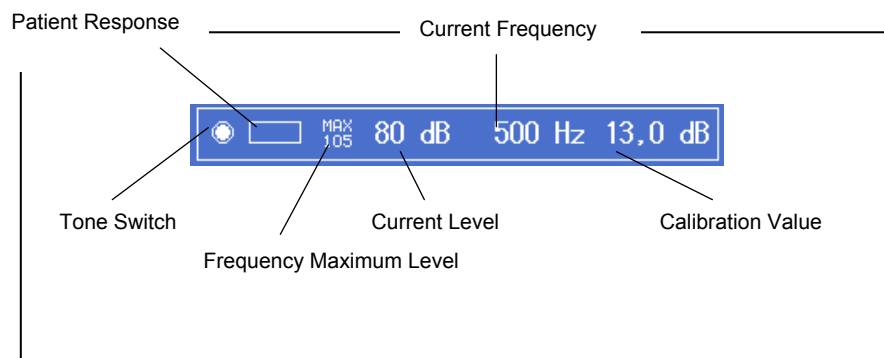
Headset calibration. Figure 12

This is the headset calibration menu.

In the audiogram in the screen picture you can see the calibration of the transducer and the calibration level by looking at lines. The dotted lines are the calibration values drawn with offset in the calibration level (normal line). Above the audiogram we have an information window.

The information window

The information window contains information that can be helpful working with the calibration. The figure below shows what kind of information that is displayed.



Information Window. Figure 13

How to calibrate...

1. Select by means of frequency increase/decrease the frequency to be calibrated or start to calibrate the pre-selected frequency.
2. Press intensity increase/decrease for channel 1 until the desired sound pressure level has been achieved.
3. Press store. The instrument will automatically jump to the next frequency.
4. Continue to calibrate the new frequency or select another.
5. Select a new output by pressing Right, Left, Bone, FF1 or FF2 and repeat from step 1.
6. Select a new output (TDH39, CIR22/CIR33 or EAR3A) by pressing F1, F2 or F3 and repeat from step 1.
7. To change between Pure Tone and Narrow Band, use the rotary key for channel 2. Increase selects Narrow Band, decrease selects Pure Tone.

Speech Input Amplifier Adjustment:

Enter the Calibration menu.

Choose "Headset" and any transducer (TDH39, CIR22/CIR33, EAR3A ...)

Choose "CD" using the Frequency controls.

Connect a sine wave generator pre-selected to 1000 Hz, 100mV (open-circuit) to the CD1 input socket on the rear panel.

Press the CD key.

This causes a VU-meter to appear.

Adjust the Channel 1 HL dB control for 0dB on the VU-meter.

Connect the sine wave generator to the CD2 input socket, press the CD2 key and adjust the Channel 1 HL dB control for 0dB on the VU-meter.

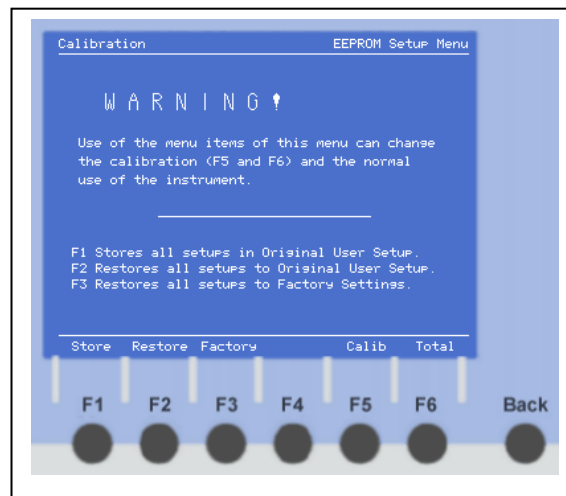
Press the "Back" key.

The instrument is now ready for speech calibration.

To test the headset Calibration

When done with the headset calibration you can enter the "Headset Real Mode" to test the calibration. Select Real (F6) to enter this menu. To change between Pure Tone and Narrow Band, use the rotary key for channel 2. Increase selects Narrow Band, decrease selects Pure Tone.

Factory Calibration Values



EEPROM Service Menu. Figure 14

If needed it is possible to insert factory data for either the calibration or for the whole setting of the instrument.

Insert Factory Calibration Values

The Calib (F5) function inserts factory values all over the calibration (calibration values, maximum levels, calibration levels, extended range settings and filter settings), but leaves the setup data untouched.

The Total function

Total (F6) is a function that is designed for pre calibrating the EEPROM if the IC is replaced. The function inserts values into the calibration and the setup that lies close to the final calibration.

Note! Using the "Calib" and the "Total" function always requires the instrument to be recalibrated.

Accessories

Item	# IA Item Number	Description
	80003602	TDH39 Audiometric headset
	80020004	IEC-M21 symmetric mono Earphone cable
	80003401	HBA Audiometric head band
	80044501	TDH39c contra headset IA
	80020504	IEC-M41 symmetric mono Earphone cable
	76401301	TDH-39P 10 Ohm Earphone Telephonics
	80044802	DD51 Cushion
	80000701	B71 Bone Conductor 30° plug
	80220202	IEC-B11 Conductor cable
	80220501	B71 Bone Conductor
	80220701	P3333 Headband for B71

Item	# IA Item Number	Description
	33514801	Accessory box For Bone Conductor
	80050301	CIR33 Insert earphone kit
	37310301	Insert cable IBC-I1
	80201403	APS3 Patient response switch
	80300202	ATP-AT235u Transducer
	80201001	SST 235 Shoulder strap
	80201101	WST235 Wrist strap
	80407702	Cable USB 2m
	80470xxx	Mains cables – country specific
	80406801	CAT40 Calibration Cavity
	80043201	DD45 Audiometric headset/ Optional
	80042802	DD45 telephone 10ohm For DD45 headset

Item	# IA Item Number	Description
	80001201	HBX235u Headset clinical optional
	80310001	HBZ23501 Headband
	80030901	HB7 black with 1yoke Headband
	80045701	DD45PA audiometric headset - Peltor
	80000201	TDH39PA with Peltor Headset optional
	80000301	TDH39AA with Amplivox Headset
	80000401	Eartone 5A 10 Ohm OEM optional
	80003201	Eartone 3A 10Ohm optional
	80002802	MTH400m Monitor Headset complete PC-130 optional
	80003101	Headset MTH400 Monitor optional
	80405201	EM400 Electret Microphone optional

Item	# IA Item Number	Description
	80405301	EMS400 Electret Microphone optional
	80420501	UCO25 Optical USB isolation Optional

Consumables

Part	IA Part Number	Description
	81415402	BET55 Ear tip box Complete ear tip assortment and cleaning tool
 	80429101	Probe cleaning tool Assembled / open
	341357xx	Ear tip 3-5 mm, flanged
	341358xx	Ear tip 4-7 mm, flanged
	34135901	Ear tip 5-8 mm, flanged
	341339xx	Ear tip 7.5 mm, umbrella
	341340xx	Ear tip 9 mm, umbrella
	341341xx	Ear tip 10 mm, umbrella
	341342xx	Ear tip 11 mm, umbrella
	341343xx	Ear tip 13 mm, umbrella
	341344xx	Ear tip 15 mm, umbrella
	341345xx	Ear tip 19 mm, umbrella
	341346xx	Ear tip 22 mm, umbrella
	341347xx	Ear tip 7 mm, mushroom
	341348xx	Ear tip 8 mm, mushroom
	341349xx	Ear tip 9 mm, mushroom
	341350xx	Ear tip 10 mm, mushroom
	341351xx	Ear tip 11 mm, mushroom
	341352xx	Ear tip 12 mm, mushroom
	341353xx	Ear tip 13 mm, mushroom
	341354xx	Ear tip 14 mm, mushroom

Part	IA Part Number	Description
	341355xx	Ear tip 15 mm, mushroom
	341356xx	Ear tip 19 mm, mushroom
	81413201	TPR26 Thermal paper
	81426001	Cleaning cloth

Spare parts

Item	# IA Item Number	Description
	34602601	Cabinet transducer 050
	57007501	Cable transducer
	34642202	Probetip 1057
	34123001	Gasket 1057
	34642401	Cap probe
	80310601	Probe module with wires 050/...
	36303201	Button – for transducer
	36803203	Spring plate probe 050
	34705101	Clamp probe instrument 050
	36300101	Button rotary Ø36xØ6 Dark grey
	36300201	Cap curved Ø32.5xØ28.3x5 Dark grey

Item	# IA Item Number	Description
	36302001	Digitast bottom part
	36302901	Knob lower part 050
	36304801	Button upper part 040
	36305101	Button lower part 050
	31601101	M7x10 knurled nut
	37305801	Cable connection 050/..
	56000201	Pump 050
	56000301	Air reservoir
	56001401	Air conductance
	56002301	Pump tube complete
	76102501	Thermal printer
	34704901	Cabinet printer 050
	55000801	Goose neck 053

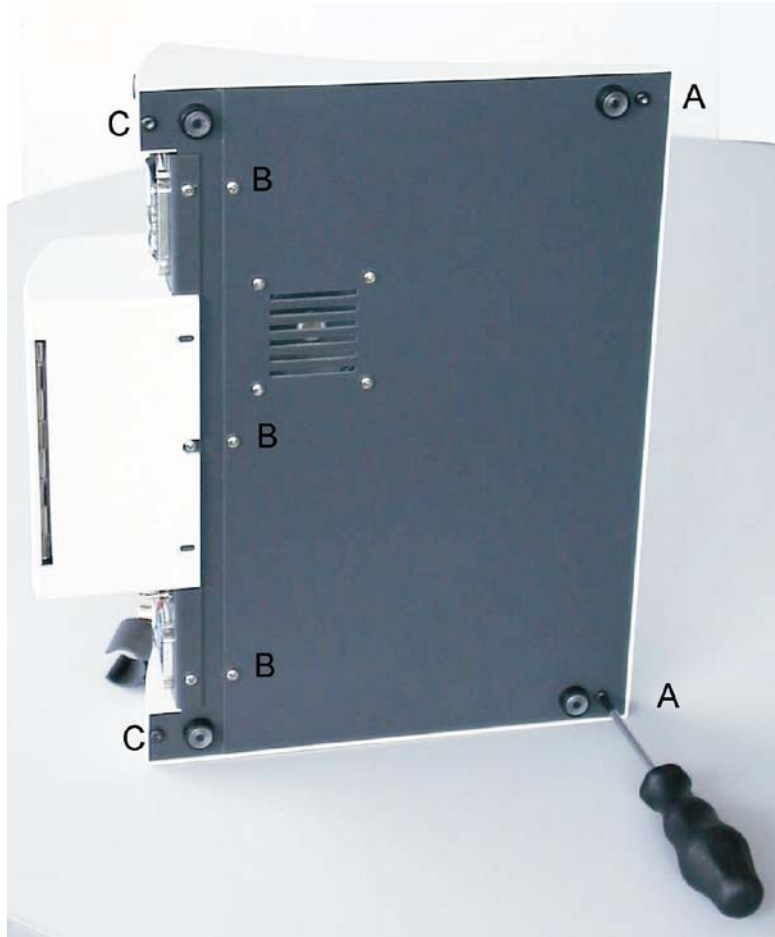
Item	# IA Item Number	Description
	50000106	Power supply UPS400
	37300302	Cable UPS400
	51007615	PCA Main board 053

Disassembly

Open Cabinet

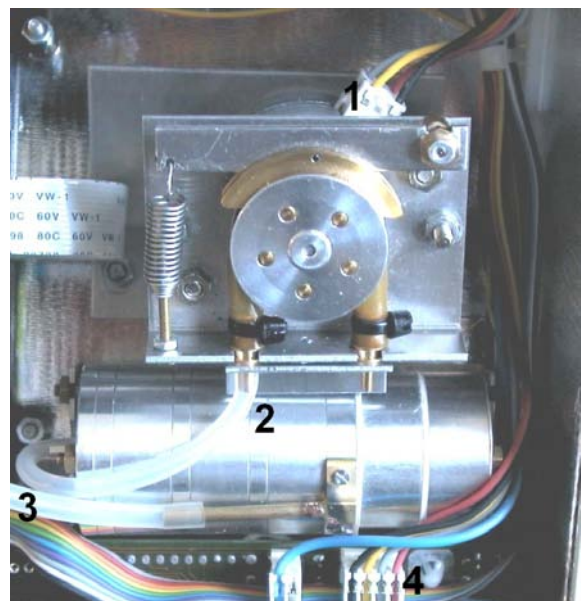
Remove 2 Torx screws A -use Torx tool T20 Remove 3 EMC screws B – use PZD1 tool
The main part of the two-piece bottom plate can now be removed for calibration

For exchange of the pump tube, remove 2 Torx screws C –use Torx tool T20



Pump Tube Connections

- 1 & 4 Wire connections from pump to Mainboard CO19
- 2 Tube from air reservoir to pump
Part number 38004101, length 85mm
- 3. Tube from air reservoir to Rear Panel Air Pipe
Part number 38000301, length 320mm



Pump Tube Replacement

Loosen the spring fixing screw (1), unhook the spring (2) and the pump arm (3) can be drawn out

Remove the screw (4) and the tube fixing plate is loose

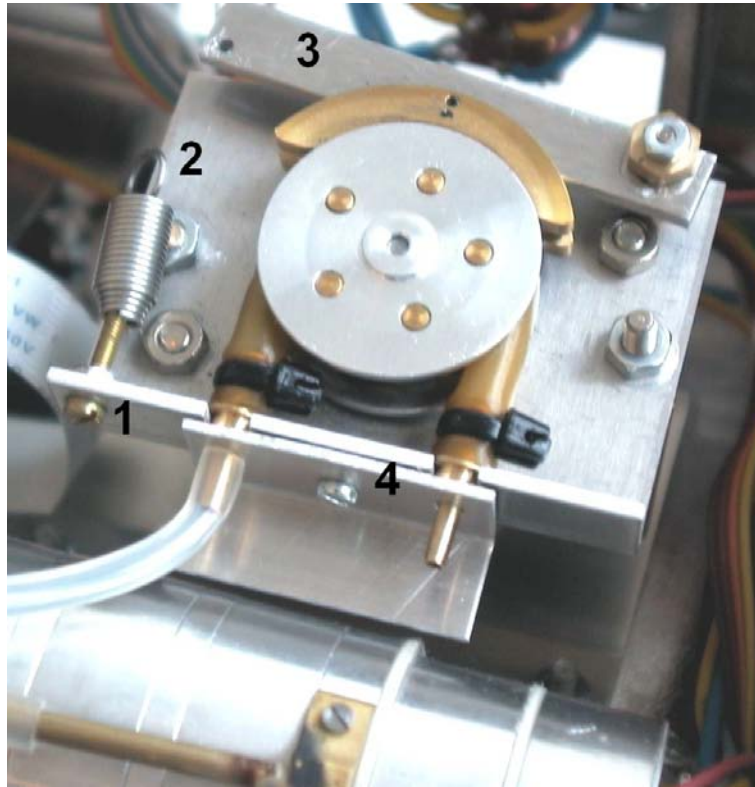
Spare part numbers:

Pump complete

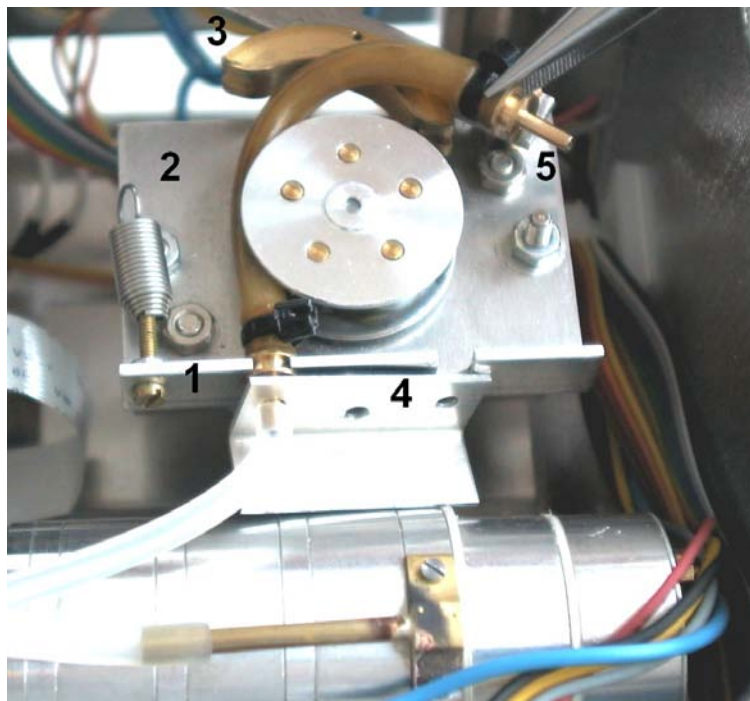
56000201

Pump tube complete

56002301



After the screw and the tube fixing plate is loose, the tube (5) can now be pulled out for replacement

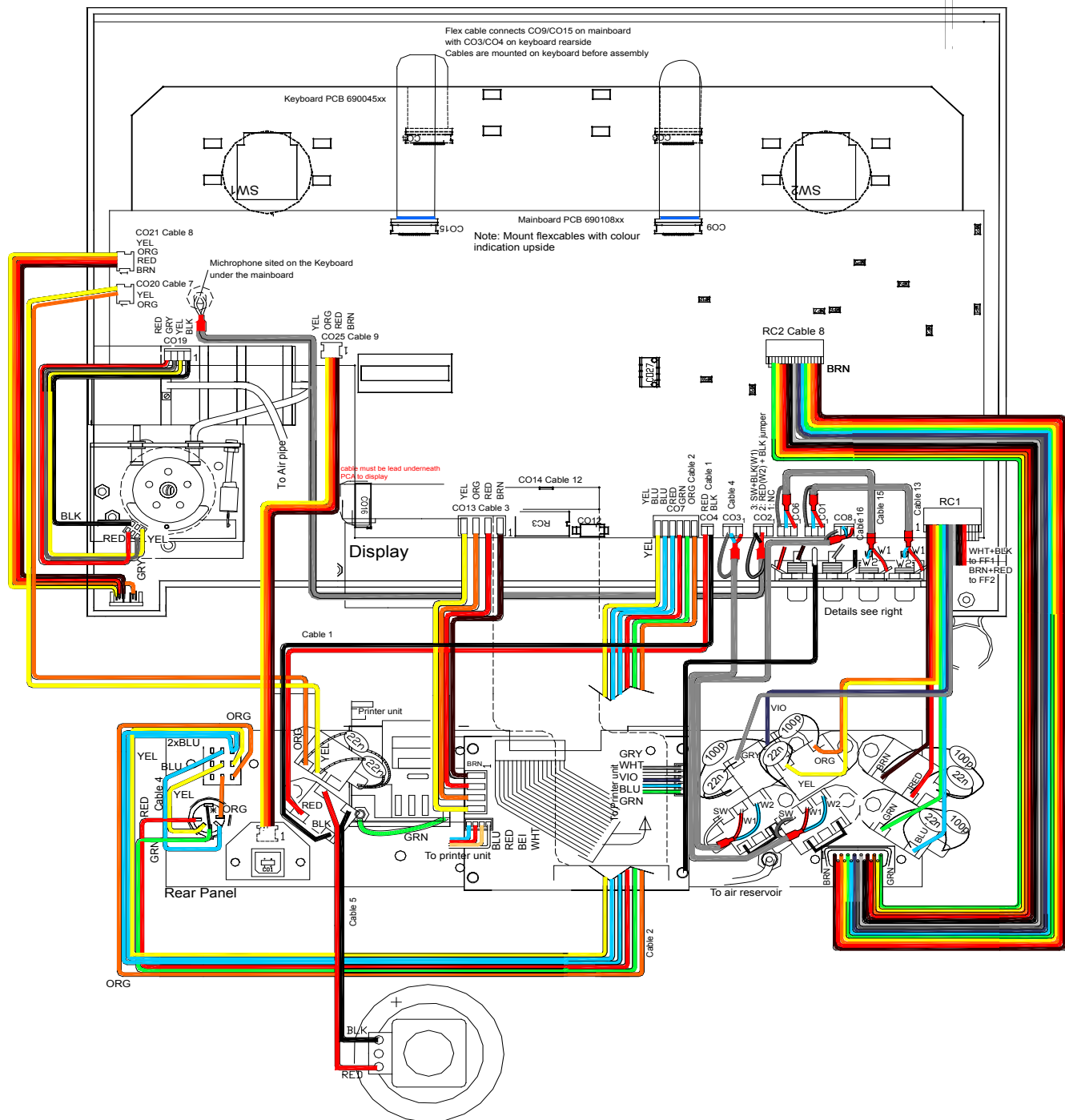


For reassembling:

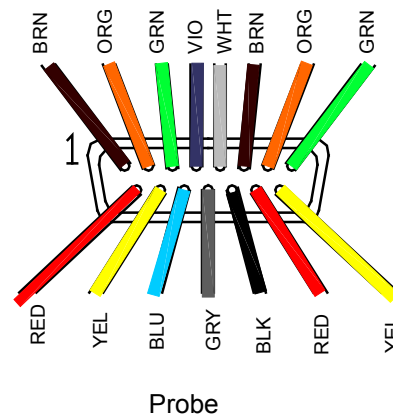
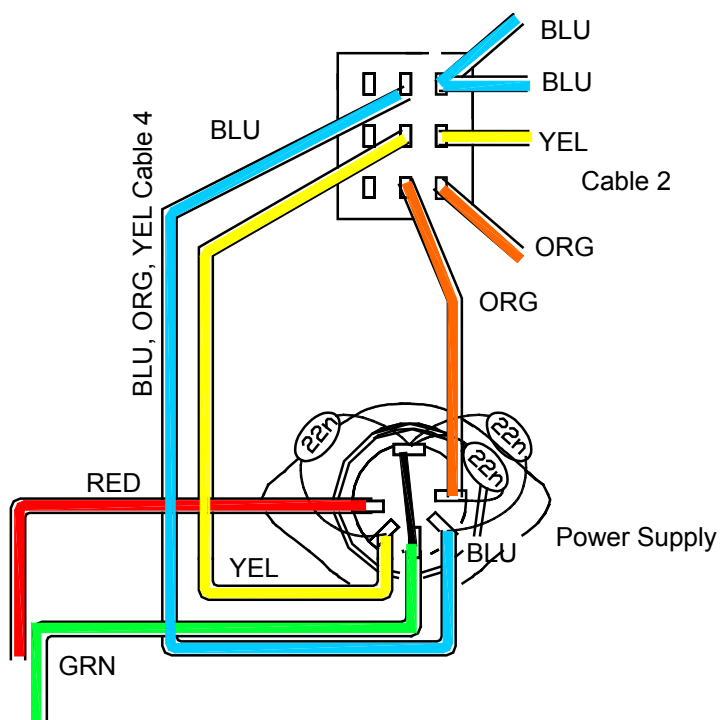
Put in the new tube and mount the fixing plate

Push in the pump arm, fix with the spring and tighten the spring

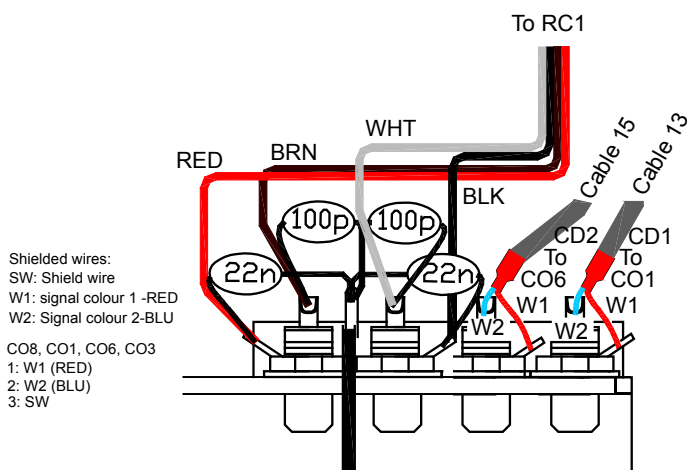
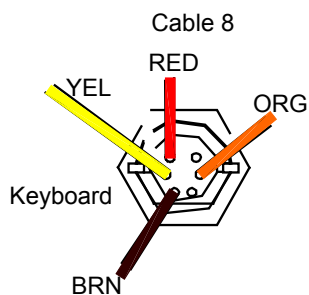
Electrical Assembling Instrument



Rear Panel Connections

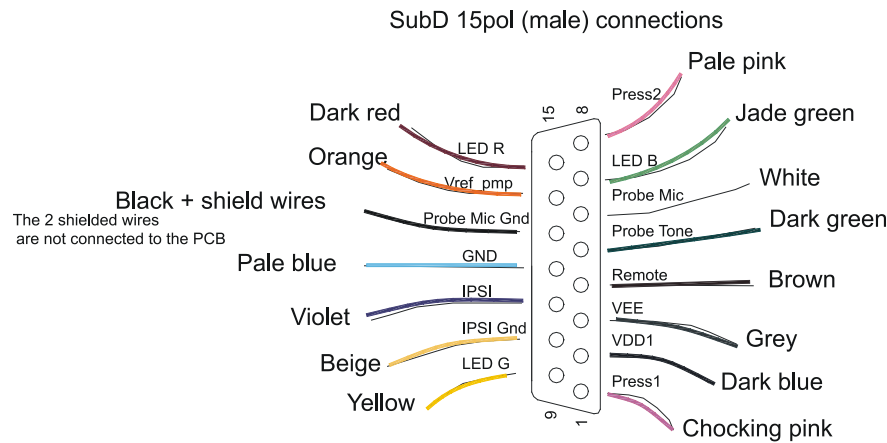
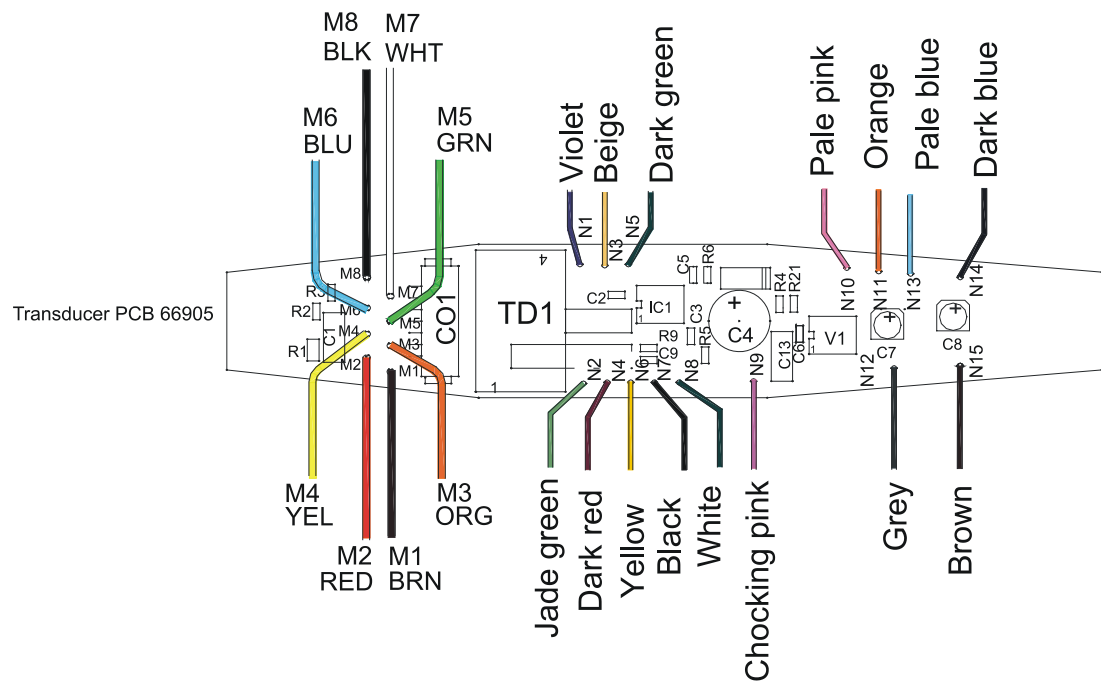


Cabinet Rear side Connections

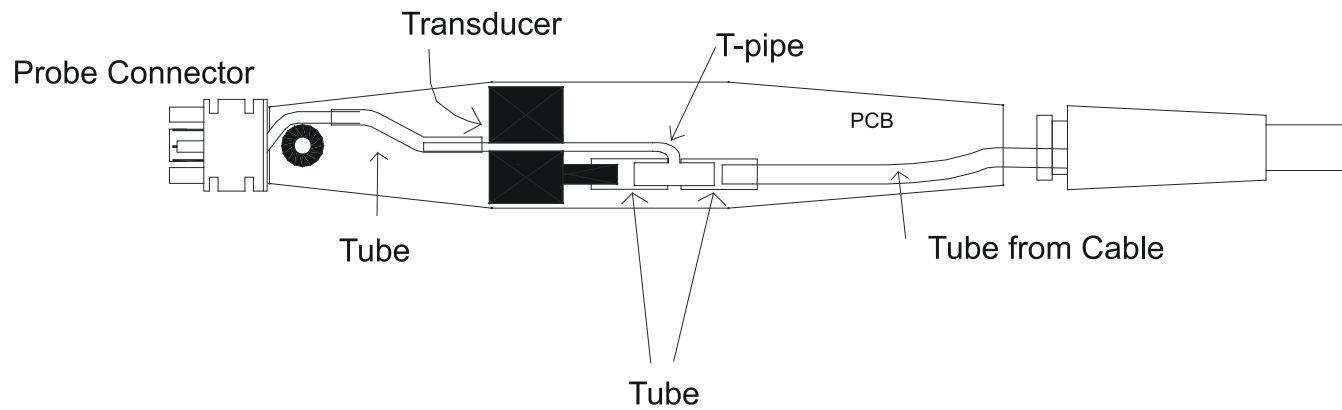


Transducer Wire and Tube Connections

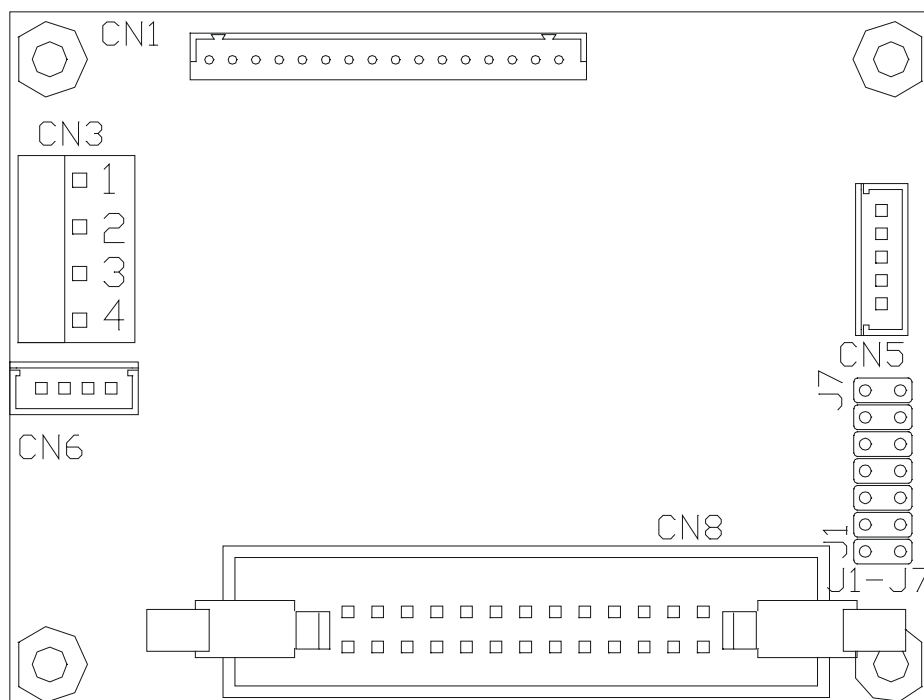
Wire Connections



Tube Connections

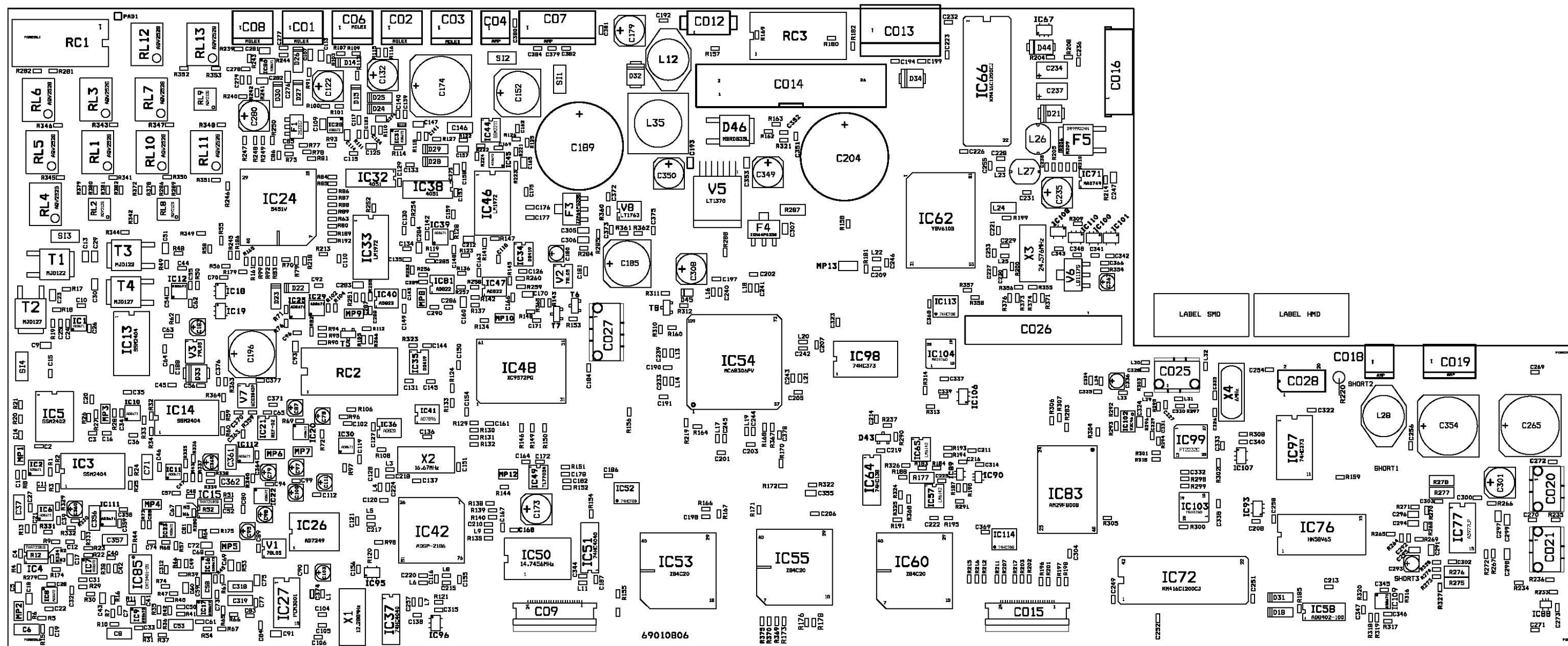


Printer Connections



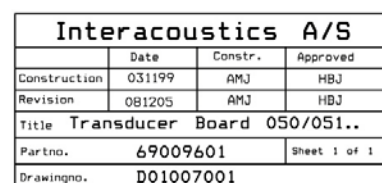
Connector No.	Function	
CN1	Thermohead	
CN3	Power	
	Pin	
	1	+5V
	2	GND
	3	+24V
	4	GND
CN5	Detector	
CN6	Motor	
CN8	Parallel Port/Centronics	
Jumper J1-J7	Keyboard and LED's Place a jumper on J3 to enable restore fonts	

Components Index

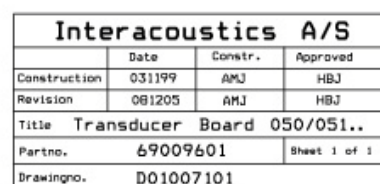


	Date	Constr.	Appr.	
Constr.	310398	AMJ	HBJ	Sheet
Revision	021008	AMJ	OG	1 of
Title Mainboard 050/051/052/053				
		Partno. 69010807 Drawingno. D01000205		

Top side
D01007001



D01007101



Appendix A Description of Serial Interface

General Specification

The Serial interface is designed to transmit data from the audiometer to a computer, and to control the audiometer from a computer.

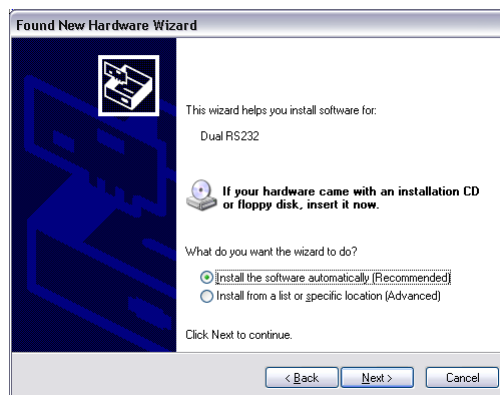
The Baud rate is 38400 B/S and the data format is 8 data bits, Even parity and one stop bit.

Installing the USB Driver on the PC

Connect the Instrument to the PC with a USB cable and turn on the instrument, the following window should appear. The Driver is available from Windows Update if the PC is connected to the internet or it can be found on the CD with the operation manual.



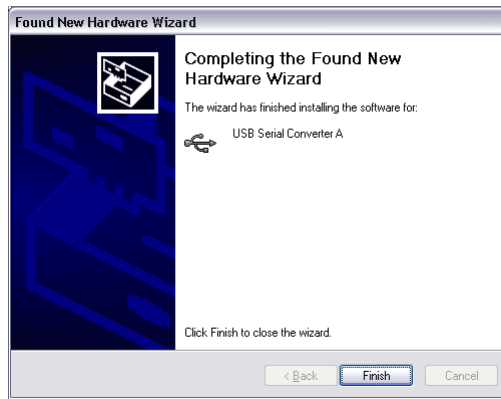
Click Next and the following window should appear.



Insert the CD, if the PC is not connected to the internet, click Next.

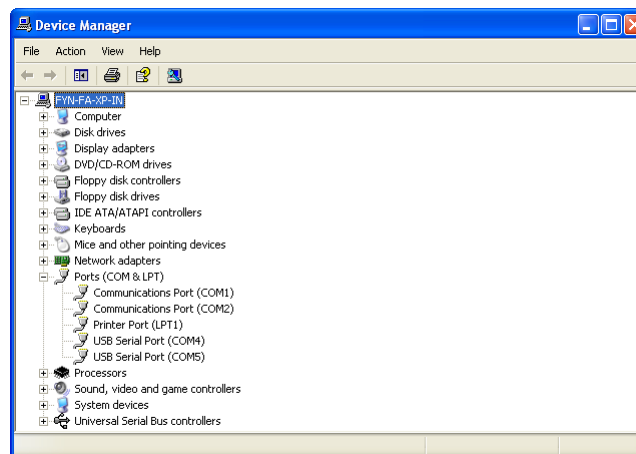


When the Driver is found the following window appears:

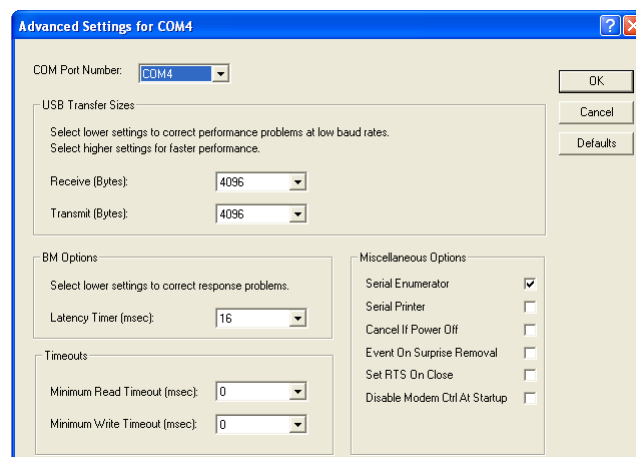


Click Finish, the Found New Hardware Wizard now starts over again because a driver for Serial Converter B needs to be installed, follow the directions above.

The Driver for the USB Serial Converter is now installed, to find out which COM port to use when communicating with the instrument start the Device Manager (Click Start, My Computer -> properties, Hardware -> Device Manager). The Port is recognized as “USB Serial Port” use the one with the lowest number.



If the COM port number is higher than it is possible to set in the PC application, it is possible to change the number by selecting properties for the USB Serial Port, then Click Hardware and Advanced, the following window should appear:

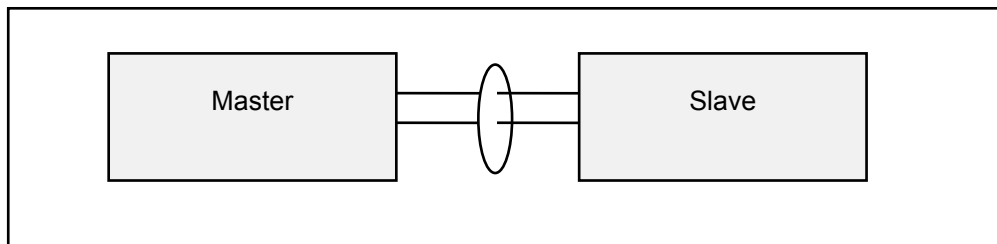


Change the COM port number in the drop down box.

Communication

Serial Standard for Interacoustics A/S

Both the computer and the instrument can send out a request for information or send back requested information. To make it easier to understand how the philosophy behind the Serial communication standard works for an instrument and a PC the following terms will be used. The part that request information will be called a Master and the part who will send back requested information will be called a Slave.



Master/slave communication. Figure 2

Data transmission between the Master and the Slave are using the following format.

Data packet from a Master device.

Recipient	Sender	Direction	Header	Data	CRC (optional)
-----------	--------	-----------	--------	------	----------------

Data packet from a Slave device.

Recipient	Sender	Header	Data
-----------	--------	--------	------

“Recipient” and “sender” are reserved for later use and can be ignored. Both the Recipient and the Sender are consisting of two bytes each.

A data packet from a Master will always contain a Direction. This direction tells the slave if it has to store or to send out the kind of data the header describes. The header is an indicator for the type of data and how they are transmitted.

Control Codes

All information's in the transmission between a Master and a Slave are controlled by control codes (see table 1).

Code	Hex	Description	Code	Hex	Description
STX	02	Start of TeXt	GS	1D	Group Separator
EOT	04	End Of Transmission	RS	1E	Record Separator
SOH	01	Start Of Header	SI	0F	Shift In
US	1F	Unit Separator	SO	0E	Shift Out
OK	18	CRC Ok	ERR	19	CRC Error

Control Codes. Table 1.

A data packet from a Master will look like this with all its control codes:

STX	Recipient	US	Sender	US	Direction	SOH	Header	US	Data	US	EOT
------------	-----------	-----------	--------	-----------	-----------	------------	--------	-----------	------	-----------	------------

Or with CRC check

STX	Recipient	US	Sender	US	Direction	SOH	Header	US	Data	US	CRC Value 5 digits	EOT
------------	-----------	-----------	--------	-----------	-----------	------------	--------	-----------	------	-----------	-----------------------	------------

Direction can either be SO or SI. If It is a SO (shift out) direction the Master wants to send data into the slave and if it is a SI (shift in) direction the Master wants to receive data.

A data packet from a Slave will look like this with all its control codes:

STX	Recipient	US	Sender	US	SOH	Header	US	Data	EOT
------------	-----------	-----------	--------	-----------	------------	--------	-----------	------	------------

Note! When a Master is using a SO direction the slave will send back nothing! When the master uses CRC check, the slave respond with OK or ERR.

Each time data is transmitted a US control code is added. Ex. 10 US 125 US With this construction it is always possible to see when all bytes in a single data transmission is completed.

CRC Check

The Instrument supports CRC Check on the bytes received from the PC. If the data packet contains a CRC value the Instrument calculates the CRC value of the bytes received and responds with OK or ERR. If the Instrument responds with ERR, send the data packet again. The CRC value is calculated from the STX to and including the EOT, the CRC value is added between the last US and EOT, and must always be 5 digits.

Header and Data Formats

A header consists of a control code (SOH) and 6 bytes (header). Each header tells witch kind of data that follows and how the data format is. The following table describes the different types of headers and their data format.

Block Start Header and Block End Header

If the Master wants to send a sequence of headers, and do not want the Slave to respond on the EOT's, the headers is send with a Block Start in the beginning and a Block End at the end. The slave waits for the Block End, before it processes the data. Similar when the Slave sends back data to the Master, it can pack the data headers in between a Block Start and a Block End, to indicate when all the requested data is send.

Block Start

Header	Description	Format
BLST00	Block Start	

Block End

Header	Description	Format
BLEN00	Block End	

Audiological Information

Tone Audiogram

Left Phone

Header	Description	Format
GTLP00	Hearing Level	Frequency US dB US frequency US
GTLP01	UCL Level	Frequency US dB US frequency US
GTLP05	Masking Level	Frequency US dB US frequency US

Right Phone

Header	Description	Format
GTRP00	Hearing Level	Frequency US dB US frequency US
GTRP01	UCL Level	Frequency US dB US frequency US
GTRP05	Masking Level	Frequency US dB US frequency US

Left Bone

Header	Description	Format
GTLP00	Hearing Level	Frequency US dB US frequency US
GTLB05	UCL Level	Frequency US dB US frequency US

Right Bone

Header	Description	Format
GTRB00	Hearing Level	Frequency US dB US frequency US
GTRB05	Masking Level	Frequency US dB US frequency US

SISI Data

Left Phone

Header	Description	Format
SILP00	SISI Data	Frequency US Intensity US Modulation US Presentation US Answer US Frequency

Right Phone

Header	Description	Format
SIRP00	SISI Data	Frequency US Intensity US Modulation US Presentation US Answer US Frequency

Speech Audiogram

Standard Speech

Header	Description	Format
GSF100	Free Field 1	dB US % US dB US .. GS M/N US RS dB US % US
GSF200	Free Field 2	dB US % US dB US .. GS M/N US RS dB US % US
GSFF00	Reference curve for Free Field	dB US % US dB US % US...
GSLB00	Left Bone	dB US % US dB US .. GS M/N US RS dB US % US
GSLP00	Left Phone	dB US % US dB US .. GS M/N US RS dB US % US
GSLP01	Left Phone UCL	dB US
GSLR00	Reference curve for phones	dB US % US dB US % US...
GSRB00	Right Bone	dB US % US dB US .. GS M/N US RS dB US % US
GSRP00	Right Phone	dB US % US dB US .. GS M/N US RS dB US % US
GSRP01	Right Phone UCL	dB US

USA Speech

Header	Description	Format
GSF102	Free Field 1 SRT	SRT US Masking US UCL US...
GSF202	Free Field 2 SRT	SRT US Masking US UCL US...
GSF103	Free Field 1 SDS1	Discrimination US SDS1 US Masking US...
GSF203	Free Field 2 SDS1	Discrimination US SDS1 US Masking US...
GSF104	Free Field 1 SDS2	Discrimination US SDS2 US Masking US...
GSF204	Free Field 2 SDS2	Discrimination US SDS2 US Masking US...
GSF105	Free Field 1 SDS3	Discrimination US SDS3 US Masking US...
GSF205	Free Field 2 SDS3	Discrimination US SDS3 US Masking US...
GSRP02	Right Phone SRT	SRT US Masking US UCL US...
GSLP02	Left Phone SRT	SRT US Masking US UCL US...
GSRP03	Right Phone SDS1	Discrimination US SDS1 US Masking US...
GSLP03	Left Phone SDS1	Discrimination US SDS1 US Masking US...
GSRP04	Right Phone SDS2	Discrimination US SDS2 US Masking US...
GSLP04	Left Phone SDS2	Discrimination US SDS2 US Masking US...
GSRP05	Right Phone SDS3	Discrimination US SDS3 US Masking US...
GSLP05	Left Phone SDS3	Discrimination US SDS3 US Masking US...

Note: If value equals 32700 then No Data.

Impedance Audiometry

Tympanogram

Left Ear

Header	Description	Format
GCLE00	Tympanogram Left Ear (Old format)	Compliance US Volume US Pressure US Gradient US Press1 US Compl1 US Press2 US compl2 US.....
GCLE01	Tympanogram Left Ear	ComplianceReal US ComplianceImag US VolumeReal US VolumeImag US Pressure US Gradient US GradientUnit US NumberOfPoints US StartPressure US StopPressure US Pumpspeed US ProbeToneFreq US Press[0] US Complreal[0] US Complimg[0] US Press[NumberOfPoints] US Complreal[NumberOfPoints] US Complimg[NumberOfPoints] US EOT

Right Ear

Header	Description	Format
GCRE00	Tympanogram Right Ear (Old format)	Compliance US Volume US Pressure US Gradient US Press1 US Compl1 US Press2 US compl2 US.....
GCRE01	Tympanogram Right Ear	ComplianceReal US ComplianceImag US VolumeReal US VolumeImag US Pressure US Gradient US GradientUnit US NumberOfPoints US StartPressure US StopPressure US Pumpspeed US ProbeToneFreq US Press[0] US Complreal[0] US Complimg[0] US Press[NumberOfPoints] US Complreal[NumberOfPoints] US Complimg[NumberOfPoints] US EOT

IPSI Reflex

Left Ear

Header	Description	Format
GRIL00	IPSI Reflex Left Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Compl11 US Compl12 US.....US GS Stimulus2 US dBHL2 US Pressure2 US Compl21 US Compl22 US.....
GRIL01	IPSI Reflex Left Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until</i> dB6 <i>if the method is sequence and 6 reflexes recorded.</i>

Right Ear

Header	Description	Format
GRIR00	IPSI Reflex Right Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Compl11 US Compl12 US.....US GS Stimulus2 US dBHL2 US Pressure2 US Compl21 US Compl22 US.....
GRIR01	IPSI Reflex Right Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until</i> dB6 <i>if the method is sequence and 6 reflexes recorded.</i>

Contra Reflex

Left Ear

Header	Description	Format
GRCL00	Contra Reflex Left Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Compl11 US Compl12 US.....US GS Stimulus2 US dBHL2 US Pressure2 US Compl21 US Compl22 US.....
GRCL01	Contra Reflex Left Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until dB6 if the method is sequence and 6 reflexes recorded.</i>

Right Ear

Header	Description	Format
GRCR00	Contra Reflex Right Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Compl11 US Compl12 US.....US GS Stimulus2 US dBHL2 US Pressure2 US Compl21 US Compl22 US.....
GRCR01	Contra Reflex Right Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until dB6 if the method is sequence and 6 reflexes recorded.</i>

Decay IPSI Reflex

Left Ear

Header	Description	Format
GAIL00	Decay IPSI Reflex Left Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Result1 US Timebase1 US Compl11 US Compl12 US....US GS S stimulus2 US dBHL2 US Pressure2 US Result2 US Timebase2 US Compl21 US.....
GAIL01	Decay IPSI Reflex Left Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until dB6 if the method is sequence and 6 reflexes recorded.</i>

Right Ear

Header	Description	Format
GAIR00	Decay IPSI Reflex Right Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Result1 US Timebase1 US Compl11 US Compl12 US....US GS S stimulus2 US dBHL2 US Pressure2 US Result2 US Timebase2 US Compl21 US.....
GAIR01	Decay IPSI Reflex Right Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until dB6 if the method is sequence and 6 reflexes recorded.</i>

Decay Contra Reflex

Left Ear

Header	Description	Format
GACL00	Decay Contra Reflex Left Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Result1 US Timebase1 US Compl11 US Compl12 US....US GS S stimulus2 US dBHL2 US Pressure2 US Result2 US Timebase2 US Compl21 US.....
GACL01	Decay Contra Reflex Left Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until dB6 if the method is sequence and 6 reflexes recorded.</i>

Right Ear

Header	Description	Format
GACR00	Decay Contra Reflex Right Ear (Old format)	Stimulus1 US dBHL1 US Pressure1 US Result1 US Timebase1 US Compl11 US Compl12 US....US GS S stimulus2 US dBHL2 US Pressure2 US Result2 US Timebase2 US Compl21 US.....
GACR01	Decay Contra Reflex Right Ear	Frequency US Pressure US Method US NumberOfPoints US GS dB1 US mS[0] US ml[0] US mS[NumberOfPoints] US ml[NumberOfPoints] US GS dB2 US <CurveData> GS <i>until dB6 if the method is sequence and 6 reflexes recorded.</i>

ETF1

Left Ear

Header	Description	Format
GILE00	ETF1 Left Ear (Old format)	Volume US Pressure1 US Press11 US Compl11 US Press12 US Compl12 US.....US GS Pressure2 US Press21 US Compl21 US Press22 US Compl22 US....
GILE01	ETF1 Left Ear	EarVolume US NumberOfPoints US StartPressure US EndPressure US PumpSpeed US GS Pressure1 US <Curve1> US GS Pressure2 US <Curve2> US GS Pressure3 US <Curve3> Curve = Pressure[0] US ml[0] US Pressure[NumberOfPoints] US ml[NumberOfPoints] US EOT

Right Ear

Header	Description	Format
GIRE00	ETF1 Right Ear (Old format)	Volume US Pressure1 US Press11 US Compl11 US Press12 US Compl12 US.....US GS Pressure2 US Press21 US Compl21 US Press22 US Compl22 US....
GIRE01	ETF1 Right Ear	EarVolume US NumberOfPoints US StartPressure US EndPressure US PumpSpeed US GS Pressure1 US <Curve1> US GS Pressure2 US <Curve2> US GS Pressure3 US <Curve3> Curve = Pressure[0] US ml[0] US Pressure[NumberOfPoints] US ml[NumberOfPoints] US EOT

Get All Data

Header	Description	Format
SGGA00	Get All Data (Old format)	Returns with all data stored. Look for headers in the return string and see in this manual for format description. The Tymp and the reflexes are transferred in the old format.

Header	Description	Format
SGGA01	Get All Data (New format)	Returns with all data stored. Look for headers in the return string and see in this manual for format description. The Tymp and the reflexes are transferred in the new format.

EEPROM Commands

Set or get EEPROM data

Header	Description	Format
GDE100	EEPROM Data	Data1 US Data2 US Data8192 US EOT
GDE101	EEPROM Data from Address + number of bytes	<i>Master SI:</i> Address US NumberOfBytes US EOT <i>Slave:</i> Data[Address] US Data[NumberOfBytes] US EOT <i>Master SO:</i> Address US NumberOfBytes US Data[0] US Data[NumberOfBytes] US EOT

Calculate Checksum

When the values in the EEPROM are changes with the two commands above, the Instrument has to calculate a new checksum of the values in the EEPROM.

Header	Description	Format
CHKS00	Calculate Checksum	

Information

Header	Description	Format
GDID00	Identification of USB version	data US
GDID01	Brand Name and version	data US
GDID03	Serial number and date	xxxxxxx US ddmmyyyy US EOT
GDID04	Instrument name and version	data US

Remote Commands

It is possible to remote control the Instrument via the USB link.

Header	Description	Format
SPKY00	Set a key or menu in the instrument	Keynumber or Menunumber US EOT
SPF100	Set frequency in channel 1	Frequency US EOT
SPA100	Set attenuator for channel 1	DB US EOT
SPA101	Set attenuator calibration for channel 1 Used for auto calibration	(Intensity – Measured Intensity) US EOT
SPA200	Set attenuator for channel 2	DB US EOT
SPI100	Set interrupter for channel 1	“1” is sound off and “0” is sound on
SICP01	Delete all patient data	
SICP02	Reset to Power-up menu	
SICP03	Update display (only in Headset calibration)	
SPIN00	Set Instrument Name	“name” US EOT max. 15 characters
SPDN00	Set Dealer Name	“name” US EOT max. 20 characters

To control the keys on the Instrument use the following table to find the key number.

Key name	Code	Key name	Code	Key Name	Code
F1	1017	Shift + F1	1117	Tymp/Reflex	1002
F2	1018	Shift + F2	1118	ETF	1006
F3	1019	Shift + F3	1119	Audiometry	1007
F4	1020	Shift + F4	1120	Man/Auto	1031
F5	1021	Shift + F5	1121	Function	1032
F6	1022	Shift + F6	1122	Talk Forward	1030
Back	1023	Shift + Back	1123	hl/ucl	1133
				Ipsi	1004
Print	1009	Print Screen	1109	Contra	1005
Pause	1001	New Subject	1101	Right	1011
				Left	1012
Store	1010	No Response	1110	Bone	1033
				Bone Right	1037
Frequency Decr	1025	Frequency Incr	1026	Bone Left	1038
Intensity Decr	1027	Intensity Incr	1028	Ext. Range	1128
Intensity Decr Ch2	1034	Intensity Incr Ch2	1035	Ch2 Off	1039
CD1/CD2	1041	Shift + CD1/CD2	1141	FF1/FF2	1047
CD1	1042	CD2	1043	FF1	1048
Monitor TB	1044	Shift + Monitor TB	1144	FF2	1049
Monitor	1045	TB	1046		

Status

Header	Description	Format
SGRS02	Reduced instrument status	Intensity Ch1 US Intensity Ch2 US Frequency US Input US Output US Transducer US Store Flag US Speech Percent US EOT
SGME00	Menu Status	Active Menu US Submenu US EOT

Input, Output and Transducer

The Input and Output parameter in the reduced status is a numerical value, use the table below to obtain the Input and Output type.

Input type	Code	Output type	Code	Transducer	Code
Pure Tone	1	Right Phone	2200	TDH39	1250
Warble Tone	2	Left Phone	2201	EAR	1251
Narrow Band	3	Contra Phone	2202	CIR22/CIR33	1252
Speech (Talkforward)	7	Probe Tone	2203	Handheld Probe	1253
Low Pass Noise	10	Probe Ipsi speaker	2204	Clinic Probe	1254
High Pass Noise	11	No output	2206	B71	1255
Wide Band Noise	12	Right Bone	2207		
		Left Bone	2208		

Active Menu and Submenu

The Menu Status returns the Active Menu and Submenu as a numerical value, use the table below to obtain the name of the menus. The Submenu is only used in Impedance Menu. It is possible to select a Menu with the SPKY00 command and the codes below.

Active Menu	Code	Active Menu	Code
Main	12000	Manual Audiometry	12031
Setup	12001	Impedance	12032
Common Setup	12003	Famili Test	12033
Subject	12007	HW Test	12034
Calibration	12009	Manual Reflex	12035
Tympanometry Setup	12011	ETF1	12036
Password	12012	IPSI Calibration	12037
Reflex Setup	12013	Manual Audiometry Setup	12047
Headset Real Mode	12015	Audiometer Setup	12048
Fixed Attenuator	12016	Test Audiometer Setup	12049
Advanced Setup	12017	Impedance Setup	12050
EEPROM Setup	12018	ABLB	12051
Advanced Reflex	12019	Stenger	12052
Attenuator	12021	Function	12053
Headset Calibration	12022	SISI	12054
Probe Calibration	12023	Talkforward	12055
Pressure Calibration	12024	Speech	12057
Compliance Calibration	12025	Speech Set-up	12058
Probe Real Mode	12028	Submenu	Code
Clinic	12029	Tympanogram	10
Modify	12030	Reflex	11
		Tympanogram + Reflex	12

Setup Items

The Setup Items in the Instrument can be read and written with the following header. In the table below the setup items are listed with their number and value range.

Header	Description	Format
GDSD00	Sets or Gets a Setup Item in the Instrument.	<i>Master:</i> SO US Item No US Value US EOT <i>Slave:</i> Sends nothing back <i>Master:</i> SI US Item No US EOT <i>Slave:</i> Value US EOT

Setup Name	Setup Item	Number	Value Range
Tympanometry Setup	Start Pressure	191	25 = 25 daPa ... 36 = 300 daPa
	Stop Pressure	192	0 = -600 daPa ... 23 = -25 daPa
	Pump Speed	193	10 = Low, 11 = Medium 12 = High, 13 = Automatic
	Compensation Mode	195	10 = Comp., 11 = Non Comp.
	Gradient Unit	196	10 = ml, 11 = daPa, 12 = Off
Reflex Setup A	Reflex Method	91	10 = Fixed, 11 = Screening, 12 = Auto, 13 = Sequence
	Test Stop Criteria	92	0 = Off, 1 = On
	Reflex Sensitivity	93	10 = Sensitive, 11 = Normal, 12 = Robust
	Reflexes pr Sequence	94	10 = 2 reflexes ... 14 = 6 reflexes
	Level increase	95	10 = 5 dB ... 15 = 10 dB 16 = 15 dB ... 19 = 30 dB
	Compensate for general drifting	96	0 = Off, 1 = Normal
	Reflex 1 Output	100	10 = IPSI ... 11 = Contra
	Reflex 1 Frequency	101	10 = 125 Hz ... 23 = HP
	Reflex 1 Level	102	60 = 60 dB ... Max = Max Output
	Reflex 1 Status	103	0 = Off, 1 = On
To get Reflex Setup B add 50 to Number	Reflex 2..6 has the same value range, the number is Reflex 1 Number + 4 for Reflex 2.....		
Common Setup	Power-up	215	10 = Tymp 11 = Tymp and Reflex
	Pause	220	0 = Off, 1 = On
	Communication	210	13 = USB
	Remote Switch	212	10 = L/R, 11 = Pause, 12 = L/R or Pause, 13 = Off
	Manual Reflex Attenuator	213	10 = 1 dB, 11 = 2 dB, 12 = 5 dB
	Reflex Icon Boxes	217	4 = 4, 6 = 6
	Printer	211	10 = Internal, 12 = Off
	Subject Data Printout	223	0 = Off, 1 = On
	Clinic Data Printout	218	0 = Off, 1 = On
	Print After Test	216	0 = Off, 1 = On
	Keyboard Connected	221	0 = No, 1 = Yes
	Language	224	0 = English, 1 = German

Setup Name	Setup Item	Number	Value Range
Audiometry Setup	Default Intensity	2	0 = Off, 10 = -10 dB, 70 = 50 dB
	Masking Intensity	202	0 = Turn Of, 5 = Unchanged 10 = -10 dB, 70 = 50 dB
	Not Heard Lines	3	0 = Off, 1 = On
	Output Bone Masking	38	10 = Opposite Ch1, 11 = Contra
	Bone at 8 kHz	30	0 = Off, 1 = On
	Output Channel 2	31	10 = NB, 11 = WN
	Audiometer Mode Preselect	37	10 = Auto, 11 = Man
	Numerical Readout	203	0 = Off, 1 = On
Speech Setup - L/R Standard Curve - FF1/FF2 Standard Curve	Number of Words	250	1...100
	Score Method	251	10 = Default, 11 = German
	L/R Intensity 0	252	-10...120
	L/R Score 0	253	0...100
	L/R Intensity 1	254	-10...120
	L/R Score 1	255	0...100
	L/R Intensity 2	256	-10...120
	L/R Score 2	257	0...100
	L/R Intensity 3	258	-10...120
	L/R Score 3	259	0...100
	L/R Intensity 4	260	-10...120
	L/R Score 4	261	0...100
	FF1/FF2 Intensity 0	262	-10...120
	FF1/FF2 Score 0	263	0...100
	FF1/FF2 Intensity 1	264	-10...120
	FF1/FF2 Score 1	265	0...100
	FF1/FF2 Intensity 2	266	-10...120
	FF1/FF2 Score 2	267	0...100
	FF1/FF2 Intensity 3	268	-10...120
	FF1/FF2 Score 3	269	0...100
	FF1/FF2 Intensity 4	270	-10...120
	FF1/FF2 Score 4	271	0...100
Manual Audiometry Setup	Intensity Stepdown	28	10 = Off, 11 = 5 dB ... 18 = 40 dB
	Audiometer Frequencies		
	125 Hz	5	0 = Off, 1 = On
	250 Hz	6	0 = Off, 1 = On
	750 Hz	8	0 = Off, 1 = On
	1500 Hz	10	0 = Off, 1 = On
	3000 Hz	12	0 = Off, 1 = On
	6000 Hz	14	0 = Off, 1 = On
	8000 Hz	15	0 = Off, 1 = On
	Frequency Jump Mode	1	10 = Bottom, 11 = Butterfly
	Pulse Key Function	33	10 = Multipulse, 11 = Singlepulse
	Pulse Length	34	0..95 ((Value x 50) + 250)
	Level decr/incr	35	10 = 1 dB, 11 = 5 dB
Test Audiometry Setup	HW Frequencies		
	125 Hz	16	0 = Off, 1 = On
	250 Hz	17	0 = Off, 1 = On
	750 Hz	19	0 = Off, 1 = On
	1500 Hz	21	0 = Off, 1 = On
	3000 Hz	23	0 = Off, 1 = On
	6000 Hz	25	0 = Off, 1 = On
	8000 Hz	26	0 = Off, 1 = On
	Conditions	4	10 = 2 out of 3, 11 = 3 out of 5
	ABLB Pulse Length	36	0..95 ((Value x 50) + 250)

Advanced Setup	Start Ear	70	10 = Right, 11 = Left
	Password	71(MSB) -74(LSB)	0 – 9
	Contra Headset	76	10 = CIR22/CIR33, 11 = TDH39, 12 = EAR
	Impedance Transducer	79	10 = Handheld, 11 = Clinic, 12 = Combi
	Enable ETF Test	77	0 = Disable, 1 = Enable
	Height above sea level	78	0 = 0 – 100m, 25 = 2500 – 2599m
	Seal Sensitivity	80	10 = Normal, 11 = Sensitive
Advanced Reflex Setup	Display Reflexes	40	10 = Positive, 11 = Negative
	Compliance Change	43	10 = ml, 11 = %
	Max Reflex scale limit	59	10 = 0,10 ml, 11 = 0,15 ml, 12 = 0,20 ml, 13 = 0,25 ml
	Stimuli Selection		
	250 Hz	46	0 = Off, 1 = On
	750 Hz	48	0 = Off, 1 = On
	1500 Hz	50	0 = Off, 1 = On
	3000 Hz	52	0 = Off, 1 = On
	4000 Hz	53	0 = Off, 1 = On
	6000 Hz	54	0 = Off, 1 = On
	8000 Hz	55	0 = Off, 1 = On
	WB	56	0 = Off, 1 = On
	LP	57	0 = Off, 1 = On
	HP	58	0 = Off, 1 = On
	Autotest max upper limit	60	90 = 90 dB ... 110 = 110 dB In steps of 5 dB.
	Default manual intensity	63	60 = 60 dB ... 110 = 110 dB In steps of 1 dB.
	AGC for IPSI reflex stim.	42	0 = Off, 1 = On
Advanced Audiometry	Audiometry Headset	0	10 = TDH39, 11 = EAR3A
	Bone Symbols	29	10 = R=< and L=> 11 = R=> and L=<
	Speech Mode	39	10 = Standard, 11 = USA

Examples of Transmission

All ASCII characters are separated from control codes with “ ” ! Ex. “00” means two byte each representing a zero.

Ex. 1 Transmitting all EEPROM data from the Instrument

Master:	STX “00” US “00” US SI SOH “GDE100” US EOT	Ask for EEPROM data.
Slave:	STX “00” US “00” US SOH “GDE100” US data..... EOT	Send EEPROM data.

Ex. 2 Sending all EEPROM data from the PC to the Instrument

Master:	STX “00” US “00” US SO SOH “GDE100” US data..... EOT	Send EEPROM data.
Slave:	Nothing.	
Master:	STX “00” US “00” US SO SOH “CHKS00” US EOT	Calculate new checksum
Slave:	Nothing.	

Ex. 3 Setting a key or menu in the Instrument

Master:	STX “00” US “00” US SO SOH “SPKY00” US “12001” US EOT	Select Setup menu.
Slave:	Nothing.	

Ex. 4 Getting all relevant subject data from the Instrument

Master:	STX “00” US “00” US SI SOH “SGGA00” US EOT	Ask for all data.
Slave:	STX “00” US “00” US SOH “BLST00” US EOT STX “00” US “00” US SOH “SGGA00” US data... EOT STX “00” US “00” US SOH “BLEN00” US EOT	Send all stored subject data between a B lock Start and Block End.

Ex. 5 Getting data – left phone from the Instrument

Master:	STX “00” US “00” US SI SOH “GTLP00” US EOT	Ask for data.
Slave:	STX “00” US “00” US SOH “GTLP00” US data..... EOT	Send left phone data.

Online Communication

The AA222 is capable to send information to the PC, whenever things change in the instrument and when data is obtained from the probe. The online communication is enabled from the PC, because it only is used together with a PC. The Online Communication is not completely implemented yet, so subject to change.

Header	Description	Format
OLEN00	Enable online communication	
OLDI00	Disable online communication	

How the instrument works

When the AA222 is doing its normal measurements it is running in automated mode where everything is preset. That why the menu is called “Auto impedance”. There are three screens in this mode. One where “all” information are put together (Tymp and Reflex mixed), one full screen with tymp (extended tymp) and one full screen with reflex (extended reflex). When an automated session takes place the instrument switches to a menu without any graphically interface called “Do Test”. This is the control centre of the instrument where the list of tasks to perform are placed and executed. Further more there are a “Do Tymp” menu and a “Do Reflex” menu also without graphically interface that deals with the measuring of data. That’s why the “menu” item changes during a measurement.

Menu's like EFT and Manual Reflex measurement uses the "Do Tymp" menu and the "Do Reflex" menu without the "Do Test" menu.

The inside (both hardware and software) of the instrument is designed with two sound channels. This is necessary when we need to produce both a probe tone and stimuli at the same time. The CPU is in control of a DSP with a two channel Codex. When monitoring the state of the instrument you therefore needed to show the state of two channels. The probe tone is always controlled from channel 2.

Headers from the Instrument when things change

Header	Description	Format
OLMU02	Menu Changed	Menu US EOT
OLMU03	Submenu Changed	Submenu US EOT
OLKY00	Key pressed	Key US Status US EOT

This is what strings the instrument can send when it sends the OLMU02 (Menu Changed) header

"Main", "Setup", "Common Setup", "Subject", "Calibration", "Tymp Setup", "Password", "Reflex Setup", "Headset Real", "Fixed Attenuator", "Advanced Setup", "EEPROM Setup", "Advanced Imp Setup", "Advanced Aud Setup", "Attenuator Calibration", "Headset Calibration", "Probe Calibration", "Pressure Calibration", "Compliance Calibration", "Probe Tone Calibration", "Probe Real", "Clinic", "Modify", "Tone", "Auto Impedance", "HW Family", "HW Test", "Manual Impedance", "ETF1", "Ipsi Calibration", "Headset Options", "Manual Audiometry Setup", "Audiometry Setup", "Test Audiometry Setup", "Impeadence Setup", "ABLB", "Stenger", "Function", "SISI", "Talkforward", "Reset", "Speech", "Speech Setup", "Attenuator Setup", "Cochlear Implant", "Speech USA", "Do Reflex", "Do Tymp", "Do Test", "Error".

This is what strings the instrument can send when it sends the OLMU03 (Sub Menu Changed) header

"Extended Tymp", "Extended Reflex", "Reflex and Tymp Mixed".

This is what strings the instrument can send when it sends the OLKY00 (Key pressed) header

"Pause", "Tymp", "Reflex", "Ipsi", "Contra", "ETF", "Audiometry", "Manual", "Print", "Store", "Right", "Left", "F1", "F2", "F3", "F4", "F5", "F6", "Back", "High Tymp", "Hz Decr", "Hz Incr", "dB Decr Ch1", "dB Incr Ch1", "Impedance", "Talk Forward", "Manual/Auto", "Function", "Bone", "dB Decr Ch2", "dB Decr Ch2", "Auto", "Bone Right", "Bone Left", "Ch2 Off", "Mic", "CD 1 and 2", "CD 1", "CD 2", "Monitor Talkback", "Monitor", "Talkback", "FF 1 and 2", "FF 1", "FF 2", "Store No Response", "Extended Range", "Print Screen", "New Subject", "Error".

Analog changes

Header	Description	Format
OLAN06	Input Changed	Input type US Channel US EOT
OLAN01	Intensity Changed	Intensity dB US Channel US EOT
OLAN07	Plus 20 dB Changed	Status US Channel US EOT
OLAN08	Interrupter Changed	Status US Channel US EOT
OLAN09	Output Changed	Output type US Channel US EOT
OLAN10	Transducer Changed	Transducer type US Channel US EOT

This is what strings the instrument can send when it sends the OLAN06 (Input Changed) header

"125", "250", "500", "750", "1000", "1500", "2000", "3000", "4000", "6000", "8000", "WN", "LP", "HP", "SN", "CD 1", "CD 2", "Mic", "226", "678", "800", "1000", "Probe Mic", "Talk Forward", "Talk Back", "No Input", "30000", "Error".

"30000" Means no data.

This is what strings the instrument can send when it sends the OLAN07 (Plus 20 dB Changed) header

“Off”, “Internal”, “External”, “Error”.

Internal means that the plus 20 dB step is switched on and can not be changed by pressing the Extended Range key.

External means that the plus 20 dB step can be switched on/of by pressing the Extended Range key.

This is what strings the instrument can send when it sends the OLAN08 (Interrupter Changed) header

“On”, “Off”, “Auto Off”, “Error”.

“Auto Off” is a state where the DSP itself switches off the interrupter after x mS. Used in a reflex measurement where tone is on for 500 mS.

This is what strings the instrument can send when it sends the OLAN09 (Output Changed) header

“Right”, “Left”, “Contra”, “Probe Tone”, “Probe Ipsi”, “Probe Pressure”, “No Output”, “Bone Right”, “Bone Left”, “FF1 Right”, “FF1 Left”, “FF2 Right”, “FF2 Left”, “Insert Right”, “Insert Left”, “Error”.

This is what strings the instrument can send when it sends the OLAN10 (Transducer Changed) header

“TDH39”, “EAR”, “CIR22/CIR33”, “Handheld Probe”, “Clinical Probe”, “B71”, “Free Field”.

Tymp Measurement

Header	Description	Format
OLTY02	Tymp Test Start	Start Pressure US Stop Pressure US Ear Volume US Ear US probe tone frequency US pump speed US data US EOT
OLTY01	Tymp Test Done	Compliance of max. US Pressure of max. US Gradient US NumberOfPoints US EOT
	Tymp Data	Compliance US Pressure US EOT (The data pairs are transferred to the PC between the Test Start and Test Done or Test Aborted)
OLTA00	Test Aborted	NumberOfPoints US EOT

Reflex Measurement

Header	Description	Format
OLRE02	Reflex Test Start	Ear US Pressure at which reflex is tested US probe tone frequency US Reflex Method US Output US frequency US intensity (dB) US Reflex Box number US Count Of Reflexes in the current box US Index of Reflex in the Current Box US PointsInReflex US TimeBase US EOT
OLRE01	Reflex Test Done	NumberOfPoints at this level US EOT
	Reflex Data	Compliance US EOT (The data pairs are transferred to the PC between the Test Start and Test Done or Test Aborted)

HW Measurement

Header	Description	Format
OLHW00	Header Event	Event US EOT

Events for HW Measurement

“Test Started”, “Test Done”, “Test Interrupted”, “Test Failed”, “Changed Ear”, “Retest Failed”, “Retesting”.

Audiometry Measurement (also active during HW measurement)

Header	Description	Format
OLSA00	Store Information	Intensity Ch1 US Frequency US Masking Intensity US Status US EOT
OLPA00	Patient Response	Status US EOT

Status in OLSA00 can be “Heard” and “Not Heard”.

When using the online mode it is not advisable to use static headers that requests data to be send out of the instrument (SI) at the same time. It will disturb the online transmissions from the instrument.

Most parameters send with the headers are send as text. Example : If the Right key is pressed the text “Right” is send.

Cochlear Implant

For measuring on patients with Cochlear Implant, it is possible to select a menu through USB, where the compliance data is transmitted continuous to the host. The data format is 1000 = 1 ml and is transmitted in ASCII with an US and an EOT at the end for each data, the sample rate is 226 Hz.

Header	Description	Format
SPKY00	Set the CI menu in the instrument	12060 US EOT
CIEN00	Start the CI measurement	
CIDI00	Stop the CI measurement	
CIPR00	Get the Pressure	Pressure US EOT
CIPP00	"Pump to" Pressure	Pressure US EOT (min –600 daPa and max 300 daPa)

Communication in Windows

In this section sample code shows how the communication could be made, it is using the ActiveX Control MSComm32, the code is compiled in Visual C++ 6.0.

This function opens the specified com port at 57600 baud, No parity, 8 bits and 1 stop bit. The receive threshold is set to 1 byte

```
BOOL OpenPort(int PortNo)
{
    CString SettingStr;

    SettingStr = "57600,N,8,1";

    m_CommControl.SetCommPort(PortNo);

    m_CommControl.SetSettings(SettingStr);

    m_CommControl.SetHandshaking(2);

    m_CommControl.SetPortOpen(TRUE);

    m_CommControl.SetRThreshold(1);

    return m_CommControl.GetPortOpen();
}
```

This function sends a string out on the com port

```
void SendString(CString StringToSend)
{
    VARIANT OutString;

    OutString.vt = VT_BSTR;

    OutString.bstrVal = StringToSend.AllocSysString();

    m_CommControl.SetOutput(OutString);
}
```

This function calculates the CRC value and inserts into the string.

```
CString CtestAA222Dlg::CalculateCRC(CString StringToCalculate)
{
    int CRCValue = 0, Counter;
    CString CRCString;

    for (Counter = 0; Counter < StringToCalculate.GetLength(); Counter++)
        CRCValue += StringToCalculate.GetAt(Counter);
}
```

```

    sprintf( CRCString.GetBuffer(10) , "%.5d", CRCValue );
    StringToCalculate.Insert(StringToCalculate.GetLength()-1, CRCString);
    return StringToCalculate;
}

```

This function receives data form the com port. The MSComm32 control generates an event when characters arrives at the com port and if any errors occur, see documentation of the MSComm32 control.

```

void CtestAA222Dlg::OnOnCommMscomm1()
{
    VARIANT InStringVar;
    CHAR ch;
    DWORD LastPosition;

    switch (m_CommControl.GetCommEvent())
    {
        case 2: InStringVar = m_CommControl.GetInput();
                InString += InStringVar.bstrVal;
                LastPosition = InString.GetLength()-1;

                ch = InString.GetAt(LastPosition);
                if (ch == 4) // The EOT is received
                {
                    // Now deal with the data in the InString

                    InString.Empty();
                }
                break;
    }
}

```

Appendix B User Set-up in the AA222

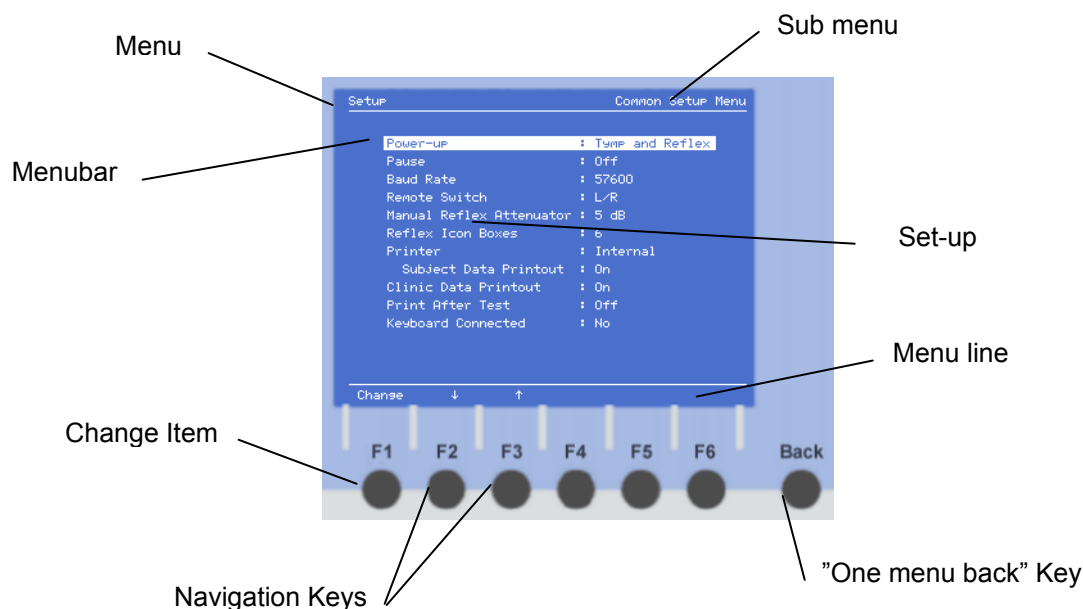
Set-up Navigation

Entering the Set-up

Press <shift> + <Back> and the instrument will return to the AA222 Main menu from any selected menu.
Press Set-up (F2) and you will enter the user set-up of the AA222.

Navigation

In each menu is possible to move a bar (see figure 1) through the set-up items and change the settings for the set-up item.

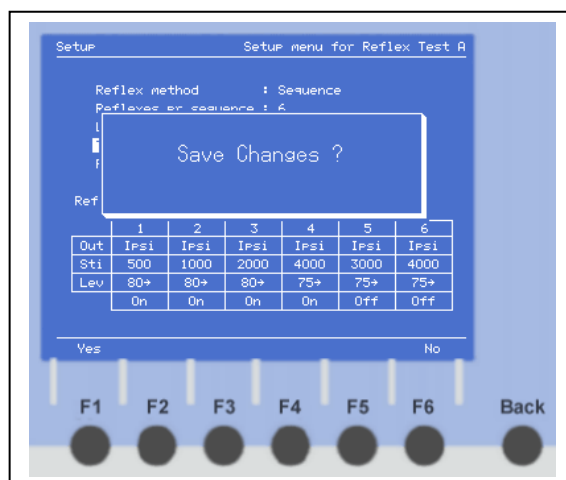


Menu Keywords Figure 15

Pressing the arrow down (F2) or up (F3) the menu bar moves and by pressing Change (F1) you can change the settings for the item selected by the menu bar.

Leaving a Menu

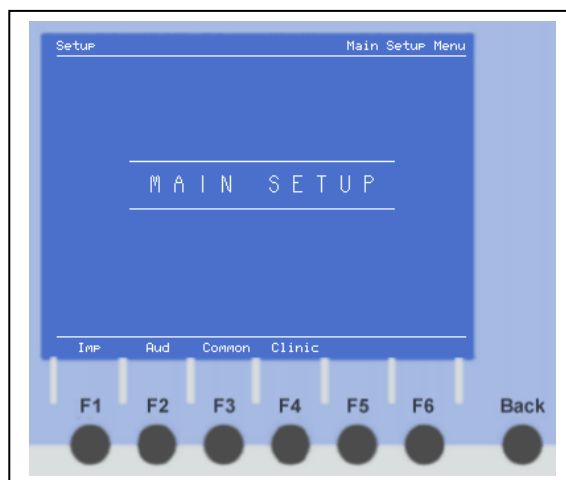
When the changes are made press the <Back> key. No changes are stored before you leave the menu and if anything is changed the instrument will ask you to save data or not. Please note that you have to press Yes (F1) or No (F6).



Save data at menu exit. Figure 16

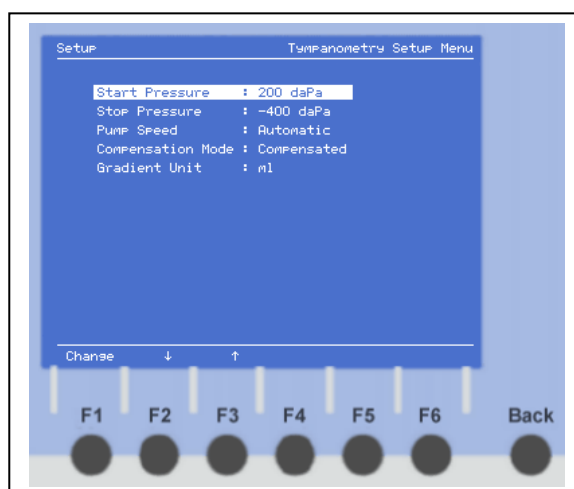
User Set-up

This is the description of the navigation in the User Set-up in AA222 and which options can be changed from the set-up. From the Main Set-up Menu (see figure 3) it is possible to access the Impedance, Audiometry, Common and Clinic set-up menus.



Main Set-up. Figure 17

Tympanometry Set-up



Tympanometry Set-up. Figure 18

Start Pressure

Factory 200 daPa

Range 300 to 25 daPa in 25 daPa steps

Description Start Pressure indicates what pressure will be established as start out point for the pressure sweep.

Stop Pressure

Factory -400 daPa

Range -25 to -600 daPa in 25 daPa steps

Description Is the pressure where the sweep will stop.

Pump Speed

Factory Automatic (150 daPa/sec, 50 daPa/sec, 150 daPa/sec)

Range Minimum (17 daPa/sec), Medium (50 daPa/sec), Maximum (150 daPa/sec) or Automatic (150 daPa/sec, 50 daPa/sec, 150 daPa/sec).

Description A slow speed will be more time consuming, but may give more detailed information. The horizontally displacement of the tympanogram peak in the sweeping direction caused by inherent hysteresis of the system will be smaller with lower speed.

Automatic is a mode where sweep speed at the beginning will be Maximum (150 daPa/sec) and when the gradient is smaller than 5 the speed will be slowed to Medium (50 daPa/sec). When the peak is bigger than 5 again the speed will be set to Maximum (150 daPa/sec) again.

Compensation Mode

Factory Compensated **Range** Compensated or Non compensated

Description Mode is set to "Compensated" if you want to have the curve displayed at the floor of the coordinate system. In "Non compensated" mode the tymp curve will be displayed including the ear canal volume.

Gradient Unit

Factory ml **Range** ml, daPa or Off

Description The gradient is an expression of the shape of the tymp curve. Narrow or wide.

If ml is selected the gradient will be calculated the following way: The program will go 50 daPa to each side from compliance value and save the two ml values. The gradient is the average of the two ml values subtracted from the compliance value.

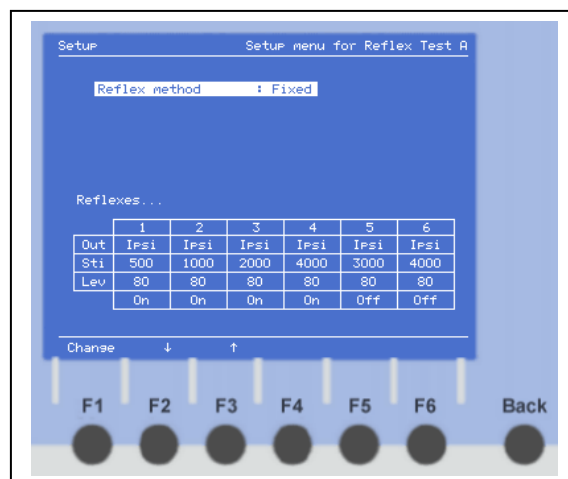
If daPa is selected the gradient will be calculated the following way: The program searches from each end of the tymp curve and stores the pressure where the point at the tymp curve is equal to compliance value divided with 2. Gradient is equal to the two stored pressures subtracted from one another.

If Off is selected the gradient box will be removed from the user interface.

Setting up Reflex Tests

The AA222 can hold information for two reflex tests: Reflex Test A and Reflex Test B. Each test can hold set-up options for 6 reflexes expressed in the table in the bottom of the screen figure (see figure 5). The upper part of the screen describes how and with what method the 6 reflexes will be taken. So the reflex set-up is a matter of determined the start conditions for each of the 6 reflexes in the table (output, stimuli, level and if in use or not) and with what method the reflex will be taken.

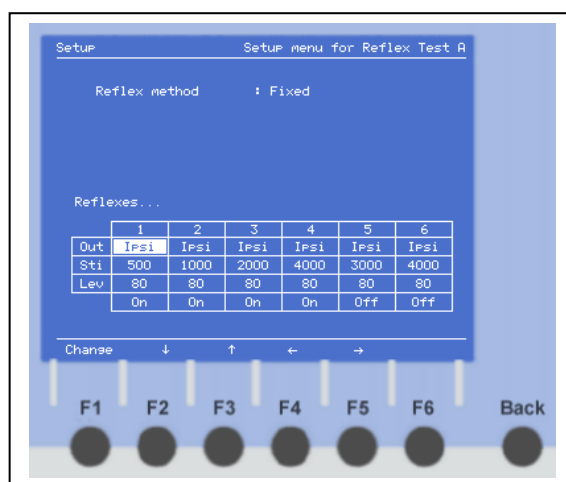
Note that it is the same method for all 6 reflexes. If you want one reflex with one method and another reflex with another method, use Reflex Test A and Reflex Test B.



Reflex Test (method is Fixed). Figure 19

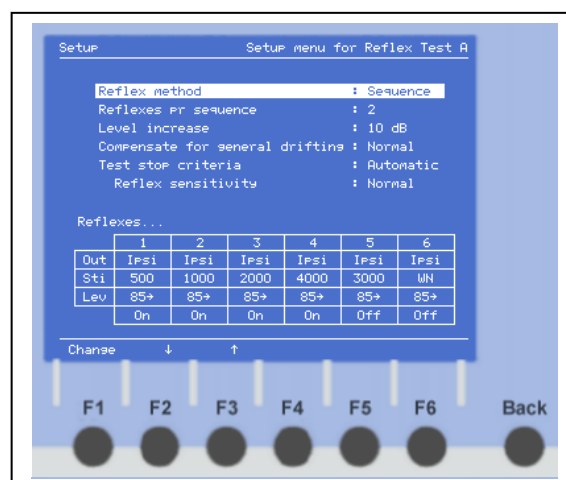
Navigating and changing in the Table

Use the 4 arrow keys to move the bar in the table. You can use change to select another option for a given item, but you may also use the dedicated keys as well. If for an example you want to change the level you can use the dB keys instead of the Change (F1). See Figure 6.



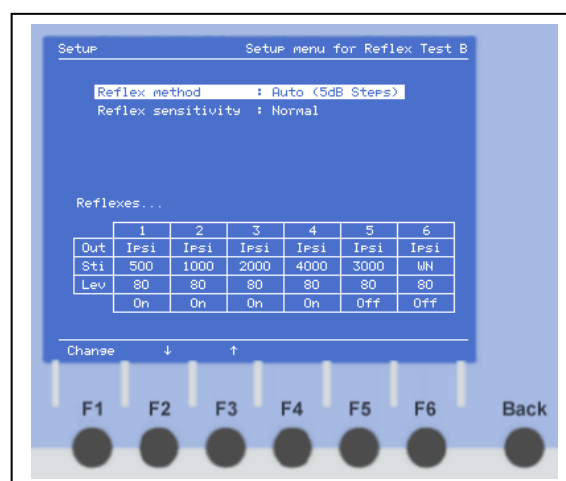
Reflex Table. Figure 20

Following figure is equal to factory settings for Reflex Test A.



Reflex Test A. Figure 21

Following figure is equal to factory settings for Reflex Test B.



Reflex Test B. Figure 22

Output

Factory See Table 1 **Range** Ipsi or contra.

Description Can be assigned to Ipsi or contra as output.

Stimuli Frequency

Factory See Table 1

Range Ipsi is 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz, 4000 Hz, WN, LP or HP. Contra is 125 Hz, 250 Hz, 500 Hz, 750 Hz, 1000 Hz, 1500 Hz, 2000 Hz, 3000 Hz, 4000 Hz, 6000 Hz, 8000 Hz, WN, LP or HP.

Description Can assign new stimuli to Ipsi or contra.

Level

Factory See Table 1

Range 60 dB to Maximum (depend of transducer and selected frequency).

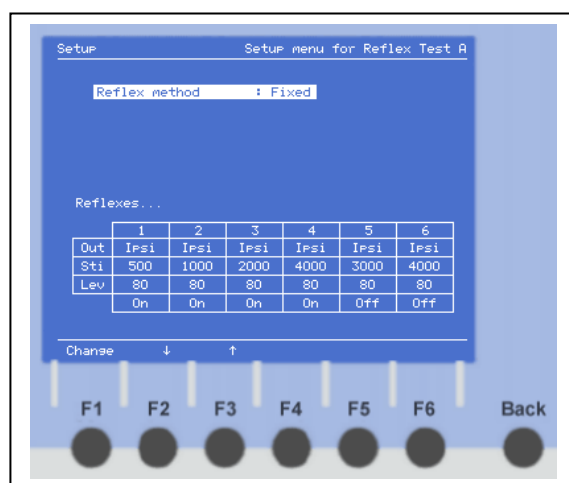
Description If Reflex Method is selected to Sequence an arrow will be put after the intensity value to indicate that this is the start level.

In table 1 you will find that the factory test configuration will perform 4 of the 6 reflexes. Setting the last row to on/off depending on what you want to start with can choose this.

Reflex Methods

The Reflex Method can be assigned to 4 different methods where three of the four methods have additional set-up points. In the following you can see what they do and how to set them up.

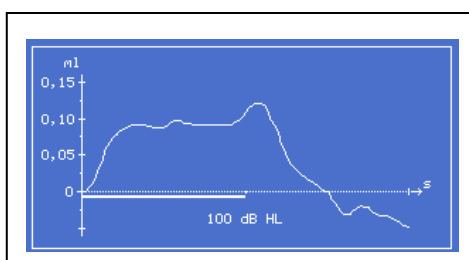
Fixed



Reflex Method Fixed Figure 23

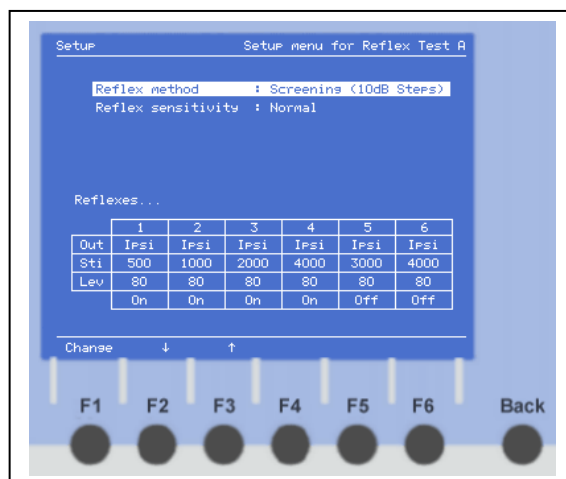
Method description

A fixed intensity reflex is one reflex taken at one intensity level like the one in Figure 10.



Fixed Reflex. Figure 24

Screening (10 dB Steps)



Reflex Method Screening (10 dB Steps). Figure 25

Method description

The Screening method is an auto test for detecting reflexes. Starting at level from the reflex table the automation will do a reflex measurement and verify the reflex against the reflex sensitivity box (see “Reflex Sensitivity”). If the reflex is bigger than the sensitivity box the test is done. If not the intensity level will increase with 10 dB and do another reflex. This will continue until the reflex is bigger than the sensitivity box or until maximum intensity level has been reached.

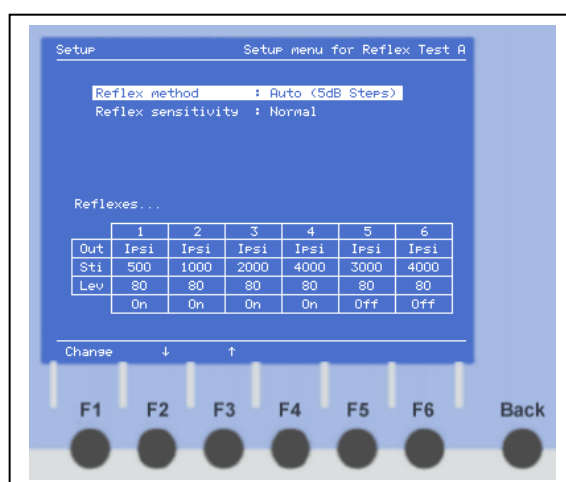
Reflex Sensitivity

Factory Normal

Range Sensitive, Normal or Robust.

Description See “Reflex Sensitivity”

Auto (5 dB Steps)



Reflex Method Auto (5 dB). Figure 26

Method description

The auto test method is a bit different from the screening method. It presents a stimulus for a time of approximately 80 ms where after it verifies the compliance against the start compliance. If the difference is bigger than the size of the reflex sensitivity test box (see “Reflex Sensitivity”), it performs a reflex measurement. The reflex is then tested against the reflex sensitivity test box. If the reflex is outside the test box the reflex measurement is done. If not the instrument performs the same test once again. If the search fails after second attempt the instrument will continue the search with the screening method in 5 dB steps instead of the currently auto search. If the reflex intensity level reaches maximum intensity level for the transducer the search is done accepting the reflex found.

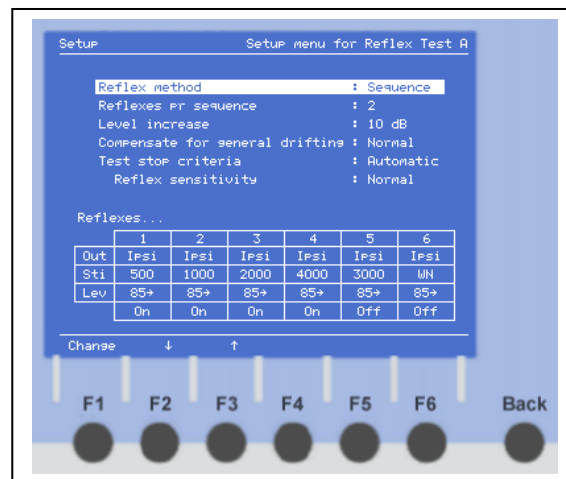
Reflex sensitivity

Factory Normal

Range Sensitive, Normal or Robust.

Description See “Reflex Sensitivity”

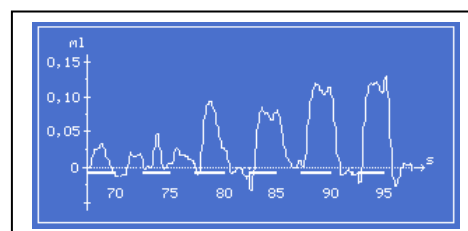
Sequence



Reflex Method Sequence. Figure 27

Method description

The sequence method gives the possibility of having up to 6 single reflexes in one Figure. The level from the table is used as start level and the jump between each reflex can be set in "Level increase". The screening method has stop criteria so it stops the measurement if the reflex is equal to or bigger than the reflex sensitivity test box. The function can be selected on or off and the level of sensitivity can be selected in the "Reflex Sensitivity" item.



Reflex Sequence. Figure 28

Reflexes pr sequence

Factory 6 reflexes pr sequence

Range 2,3,4,5 or 6 reflexes pr sequence

Description Lets you have up to 6 reflexes pr sequence. Note that the higher the number of reflexes is the less detailed the graphic will be.

Level of increase

Factory 5 dB

Range 5,6,7,8,9 or 10 dB

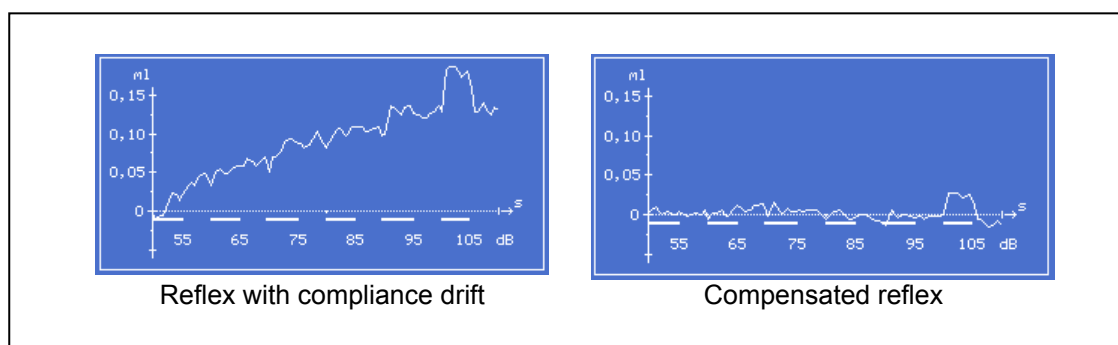
Description How many dB the intensity will be increased between each single reflex.

Compensate for general drifting

Factory Normal

Range Off and Normal

Description During a sequence reflex measurement the compliance may drift as you can see in the figure below. To compensate for this drift select the "Normal" and the reflex drift will be removed.



Compliance drifting. Figure 29

Test stop criteria

Factory Off

Range On or Off

Description Let you select if you want to skip the rest of the reflexes in a sequence when the condition are matched and continue with the next sequence.

Reflex Sensitivity

Factory Normal

Range Sensitive, Normal or Robust.

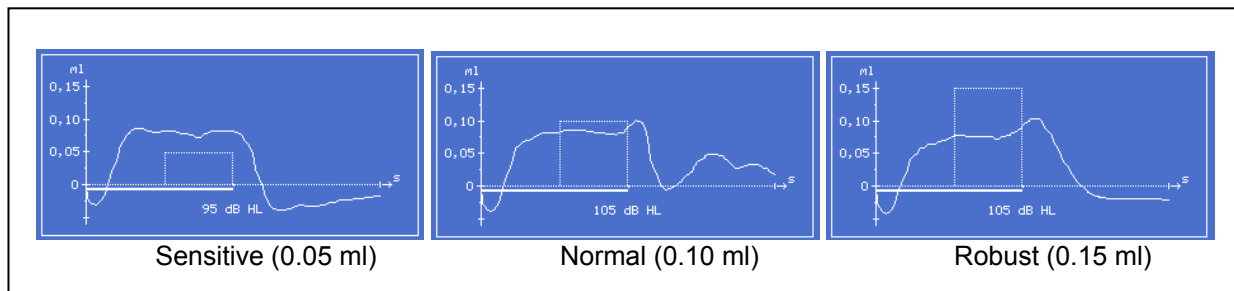
Description See "Reflex Sensitivity"

Reflex sensitivity

When using reflex the automatic methods Automatic or Screening, the AA222 uses an algorithm to determine if a reflex is okay or not. The level of sensitivity can be set with set-up item "Reflex Sensitivity" where you can choose between Sensitive, Normal or Robust. The AA222 has two different modes of leveling sensitivity : ml or % (can be set in the Advanced User Set-up) and depending on what method you will get different results. Look in the following Figures for the difference.

When using auto search for reflexes the algorithms in the software will go on until intensity has reached maximum level for the selected transducer at the given frequency. So the software in two ways can accept the reflex: the reflex does not touch the test box (the test box is normally invisible) or intensity is at maximum level. You can see what a test box is by looking at the Figures below. The test box is the dotted rectangle in the middle of the Figure.

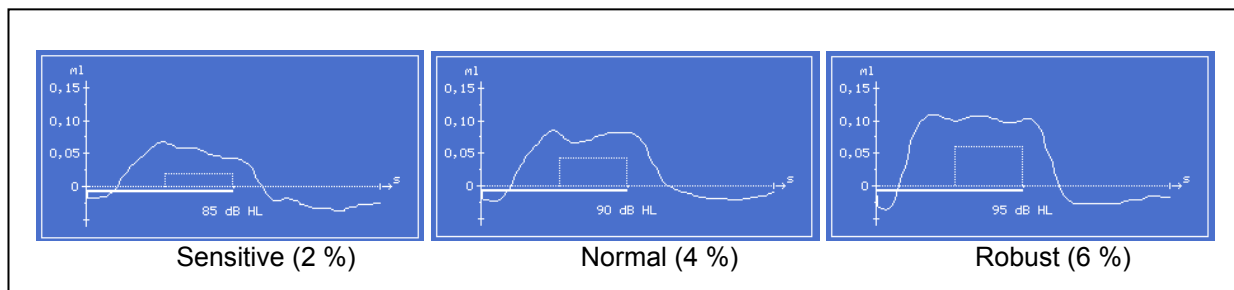
Reflex sensitivity in ml



Reflex Sensitivity in ml. Figure 30

The first reflex is okay because the reflex does not touch the test box. The two last reflexes are not okay according to the algorithm but have been accepted because of maximum intensity level.

Reflex sensitivity in %



Reflex Sensitivity in %. Figure 31

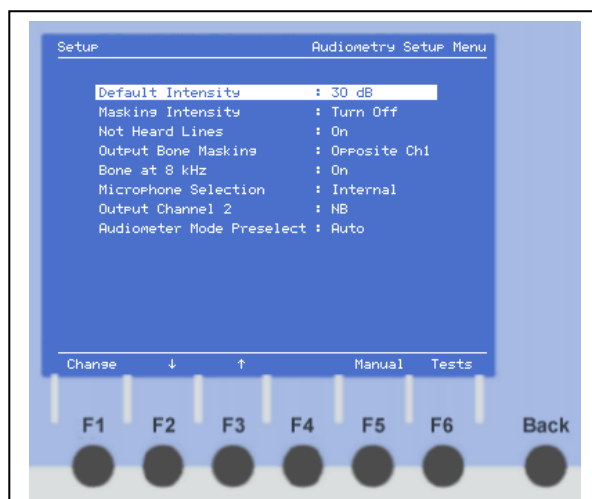
All three reflexes are okay because none of them is inside or touching the test box.

The height of the test box when using % sensitivity depends on the size of the ear volume.

The sensitivity condition is used by the auto method, screening method and by the sequence method.

Note! The test box is not shown in the AA222 software. It only serves as examples of what sensitivity is and how we do it.

Audiometry Set-up Menu



Audiometry Set-up Menu. Figure 32

Default Intensity

Factory 30 dB **Range** Unchanged, -10 to 50 dB in 5 dB steps

Description If Unchanged is selected the instrument will behave as follows:

In manual audiometry the intensity it will hold its level when shifting transducer and will initially go to 30 when selecting the manual audiometry.

In the HW test the intensity will always go to 40 dB no matter what the previous intensity was.

If a value is selected the instrument will behave as follows:

Entering one of the two menus or changing transducer the intensity will go to the selected level.

Masking Intensity

Factory 0 dB **Range** "Turn Of", Unchanged, -10 to 50 dB in 5 dB steps

Description If Unchanged is selected the instrument will behave as follows:

In manual audiometry the intensity it will hold its level when shifting transducer and will initially go to 0 when selecting the manual audiometry.

If a value is selected the instrument will behave as follows:

Entering a menu or changing transducer the intensity will go to the selected level.

If Unchanged is selected the instrument will behave as follows:

The masking will switch off at menu change or transducer change.

Not Heard Lines

Factory On **Range** On or Off

Description Selects to draw line to not heard symbols or not.

Output Bone Masking

Factory Opposite Ch1 **Range** Opposite Ch1 or Contra.

Description Selects the masking output from channel 2 when Bone is selected in channel 1.

Bone at 8 kHz

Factory On **Range** On or Off.

Description Selects if Bone outputs 8 kHz or not.

Microphone Selection

Factory Internal **Range** Internal or External.

Description Selects between Talk Forward microphone (internal) or microphone socket on the rear plate (external).

Output Ch2

Factory NB **Range** NB or WN. (Narrow Band or White Noise)

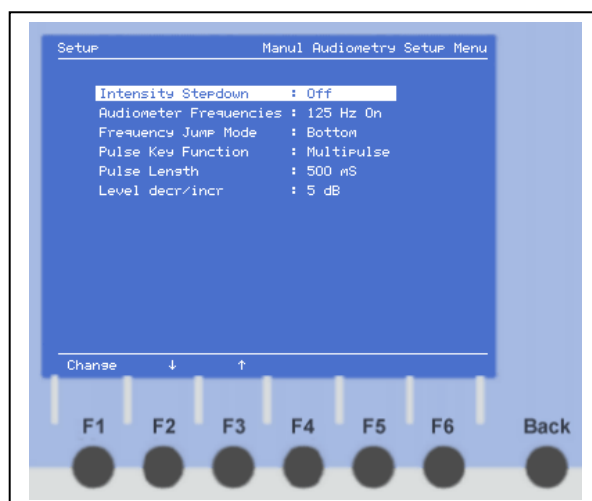
Description Selects the output in channel 2 in Tone Audiometry and H.W. test.

Audiometer Mode Preselect

Factory Auto **Range** Auto or Manual.

Description Selects the Audiometer Mode to enter when the Audiometry Key is pressed.

Manual Audiometry Set-up Menu



Manual Audiometry Set-up Menu. Figure 33

Intensity Stepdown

Factory Off **Range** Off – 5 – 10 – 15 – 20 – 25 – 30 – 35 – 40 dB

Description Is used to select how much the Intensity is decreased when the frequency is changed.

Audiometry Frequencies

Factory All frequencies are selected as factory setting

Range 125 Hz, 250 Hz, 750 Hz, 1500 Hz, 3000 Hz, 6000 Hz and 8000 Hz can be selected as On or Off.

Description Use the frequency keys to select the desired frequency and press Change (F1) to select “On” or “Off”.

Frequency Jump Mode

Factory Bottom **Range** Bottom or Butterfly

Description Is used to select how the frequency jumps, when activating the frequency keys.

Bottom

Trying to increase the frequency selection beyond 8000 Hz, will cause the frequency to jump to 125 Hz, ready to perform increasing frequency selection.

Butterfly

Trying to increase the frequency selection beyond 8000 Hz, will cause the frequency to jump to 1000 Hz, ready to perform decreasing frequency selection. Trying to decrease the frequency below the lowest frequency will cause the frequency to go to 1000 Hz ready to perform increasing frequency selection.

Pulse Key Function

Factory Multipulse. **Range** Multipulse or Singlepulse.

Description Selects the function of the pulse key.

Multipulse: The tone is presented with continuous pulsing when the tone switch is activated.

Singlepulse: The tone is presented once when the tone switch is activated.

Pulse Length

Factory 500 mS. **Range** 250 mS to 5000 mS in steps of 50 mS.

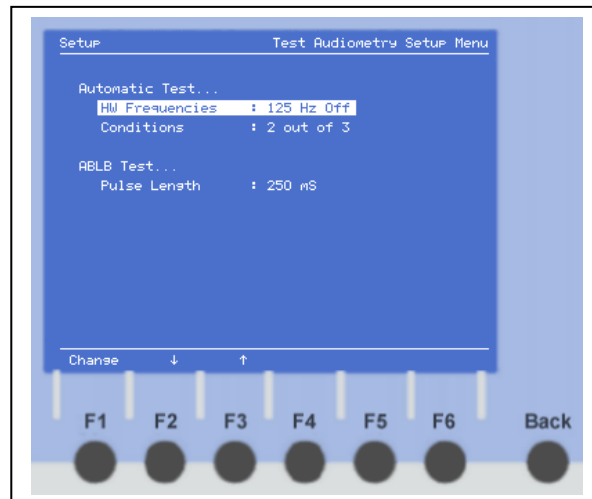
Description Selects the pulse length. When multipulse is selected the tone presentation and intermittent pause is equal.

Level decr / incr

Factory 5 dB. **Range** 1 or 5 dB.

Description Selects the intensity level decrease / increase in manual audiometry.

Test Audiometry Set-up Menu



Test Audiometry Set-up Menu. Figure 34.

Automatic Test

HW Frequencies

Factory All frequencies are “Off” as factory setting

Range 125 Hz, 250 Hz, 750 Hz, 1500 Hz, 3000 Hz, 6000 Hz and 8000 Hz can be selected as On or Off.

Description Use the frequency keys to select the desired frequency and press Change (F1) to select “On” or “Off”.

Conditions

Factory 2 out of 3

Range “2 out of 3” or “3 out of 5”

Description Is used to select the threshold method in ‘H.W. Test’. The possibilities are 2 responses out of 3 presentations, or 3 responses out of 5 presentations on the same dB value.

ABLB Test

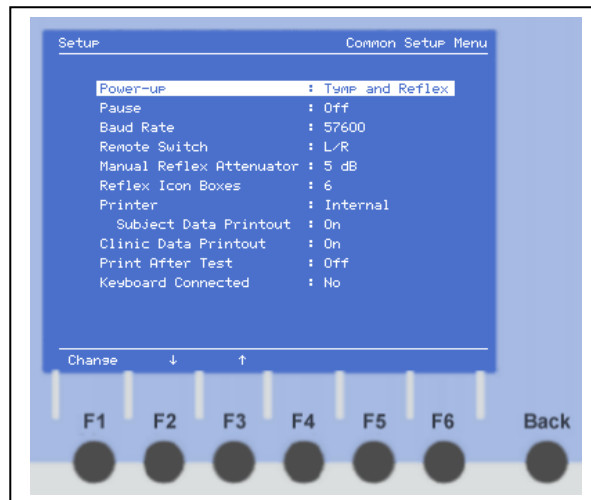
Pulse Length

Factory 500 mS.

Range 250 mS to 5000 mS in steps of 50 mS.

Description Selects the pulse length. The tone presentation and intermitted pause is equal.

Common Set-up



Common Set-up. Figure 35

Power-up

Factory Tymp and Reflex **Range** “Tymp” or “Tymp and Reflex “

Description Selects what menu the instrument will go to after power-up.

Pause – default

Factory Off **Range** On or Off

Description If “On” is selected the pause key is pre selected when a test is finished and when entering the automatic impedance menu.

Communication

Factory USB **Range** USB

Remote Switch

Factory L/R **Range** Pause, Off or L/R

Description Selects the function of the key on the impedance transducer.

Manual Reflex Attenuator

Factory 5 dB **Range** 1, 2 or 5 dB

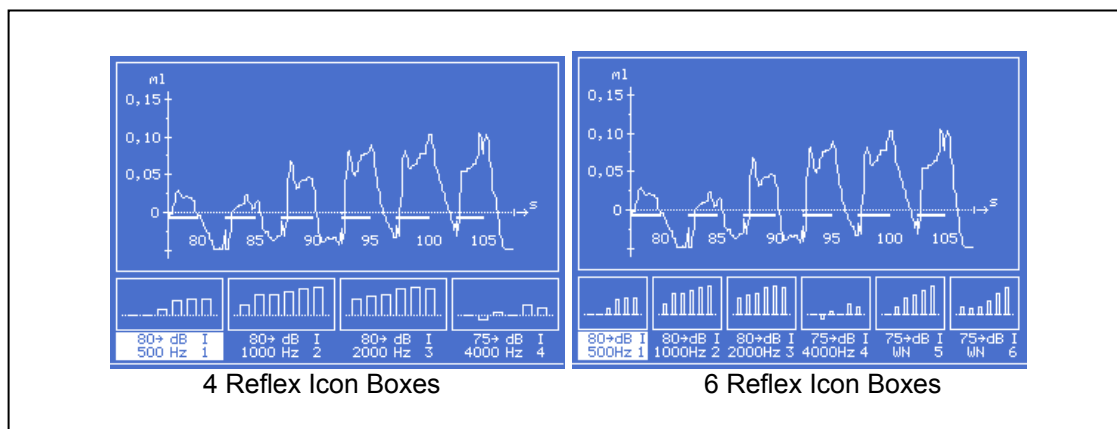
Description How many dB’s the intensity will increase/decrease when pressing the dB keys in manual impedance mode.

Reflex Icon Boxes

Factory 6 boxes

Range 4 or 6 Boxes

Description Selects between 4 or 6 reflex icon boxes (see Figure)



4 vs. 6 Reflex Icon Boxes. Figure 36

Printer

Factory Internal

Range Internal, HP PCL L3, IBM Mode or Off.

Description Select what type of printer that is attached to the instrument.

Note! The HP PCL L3 mode shall be selected in when connecting a HP Laser printer.

Subject data printout

Factory On

Range On or Off

Description If “On” is selected the subject information will be printed together with subject data.

Note! Only available when using internal printer.

Clinic data printout

Factory On

Range On or Off

Description If “On” is selected the clinic information will be printed together with subject data.

Print After Test

Factory Off

Range On or Off

Description When a test is done and data are recorded on both ears a print out will be done on the selected printer.

Keyboard Connected

Factory No **Range** Yes or No

Description If “Yes” is selected the subject menu will appear when pressing <New Subject> where it is possible to enter subject data and/or delete current data and proceed with a new measurement. If “No” is selected a dialog box saying “All Data Deleted!” will appear shortly and the instrument is ready for a new measurement.

Clinic Set-up

Clinic

Name Interacoustics A/S

Address Drejervej 8

PostCode 5610 City Assens

County Fyn

Country Denmark

Phone +45 63 71 35 55

Fax +45 63 71 35 22

Web www.interacoustics.dk

E-mail info@interacoustics.dk

Vat. No. 47208718

New Edit

F1 F2 F3 F4 F5 F6 Back

Clinic Set-up. Figure 37

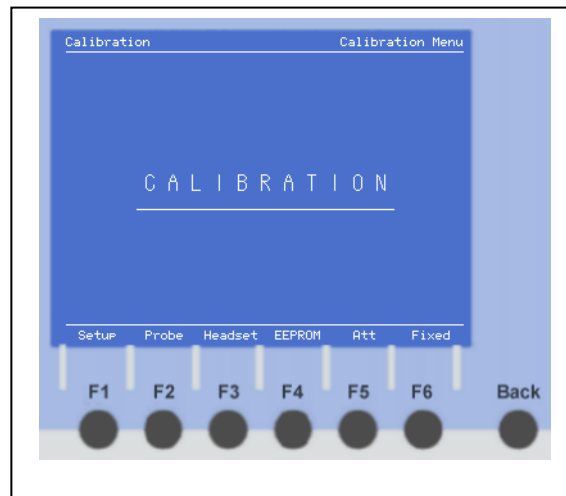
The Clinic Set-up lets you insert your clinic data used for printouts. Note that the set-up item “Clinic Data Printout” in the Common Menu needs to be On before data comes out on paper.

To enter data you need an AT keyboard (ordinary PC keyboard) attached to the AA222 while entering data.

Appendix C Advanced User Setup

Advanced User Setup

This appendix describes the advanced setup functions of the AA222.

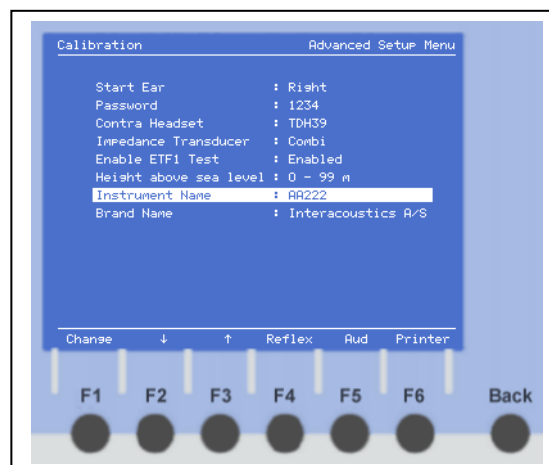


The Calibration Menu. Figure 38

In the Calibration menu there are two issues of interest for setting up the AA222. The first is the Advanced User Setup and the second is the setup storage facilities in the EEPROM menu. Note that it requires a password to access the Calibration and that entering the calibration menu is done during power up by holding down <shift> and <print> until you can enter the password.

The Advanced User Setup

The first setup that appears when pressing Setup (F1) in the calibration menu is a setup for common stuff.



Advanced User Setup. Figure 39

Start Ear

Factory	Right	Range	Right or Left
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Description Here you may choose which ear to select automatically for the first test.

Password

Factory 1234 **Range** Each digit can be change within a range of 0 to 9

Description Makes it possible to change the password for entering the calibration.

Note! You need an AT Keyboard to change this item and Keyboard “On” must be selected in the Common menu.

Contra Headset

Factory TDH39 **Range** CIR22/CIR33, TDH39 or EAR 3A

Description Here you may choose which contra headset to use.

Impedance Transducer

Factory Handheld **Range** Handheld or Clinic

Description Gives you the possibility to change between the Clinical and the Handheld impedance transducer. Note that the transducer might need to be calibrated before use and that the AA222 can hold calibration sets for both transducers at the same time.

Enalbel ETF1 Test

Factory Enable **Range** Enable or Disable

Description If you select disable it is not possible to start the ETF test.

Height above sea level

Factory 0 – 99 m **Range** 0 – 2599 m in 100 m steps

Description To give a more precise measuring system – especially at high probe tone tympanometry.

Instrument Name

Factory AA222

Description Makes it possible to change the instrument name.

Note! You need an AT Keyboard to change this item and Keyboard “On” must be selected in the Common menu.

Dealer Name

Factory Interacoustics A/S

Description Makes it possible to change the Dealer name. The Dealer name appears on the top of thermo printout.

Note! You need an AT Keyboard to change this item and Keyboard “On” must be selected in the Common menu.

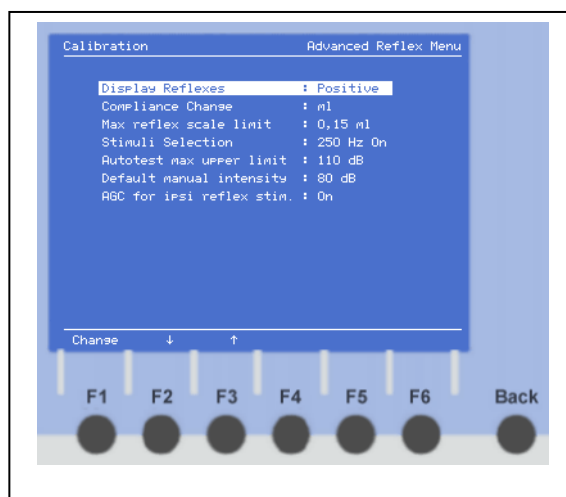
Seal sensitivity:

Sensitive This gives reproducible results. Require quiet probe handling.

Normal Quicker seal detection and less sensitive than the above selection.

Robust Very quick seal detection. AGC on the probe tone is disabled.

Advanced Reflex User Setup



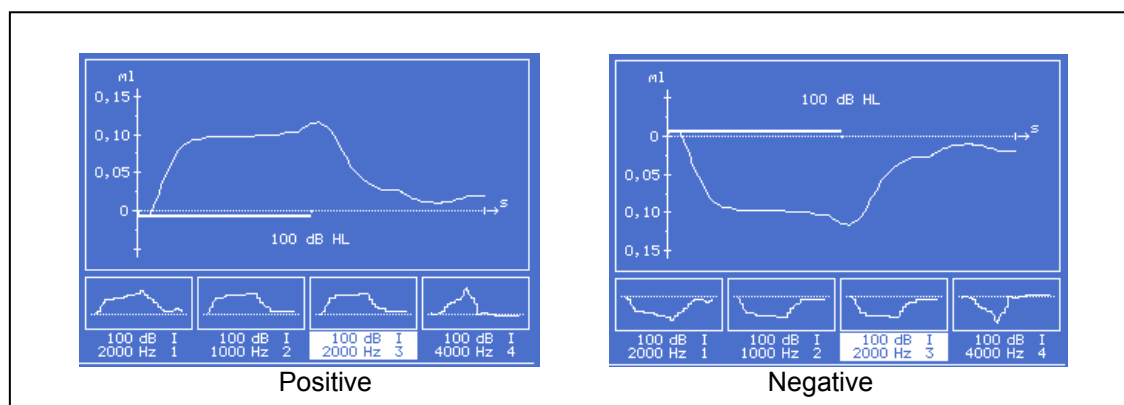
Advanced Reflex User Setup. Figure 40

Display Reflexes

Factory Positive

Range Positive or Negative

Description Selects how to display the reflexes in the diagrams.



Positive and Negative reflex display. Figure 41

Compliance Change

Factory ml

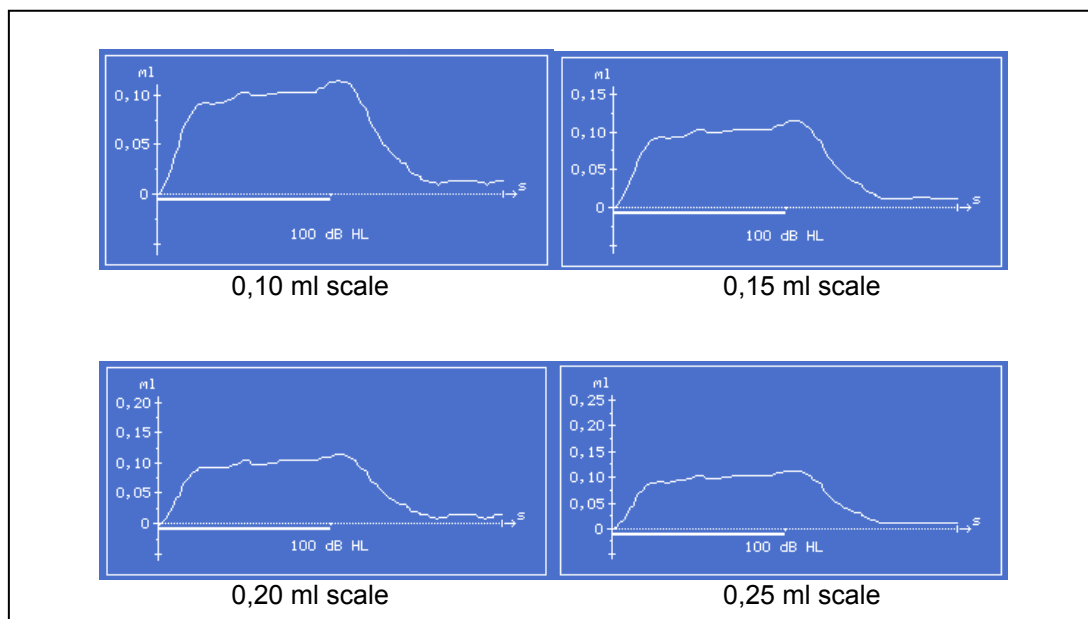
Range ml or %

Description This setup item is used in connection with the “Reflex Sensitivity” setup item from the Reflex Test A/B menu. Choose between ml (0.05, 0.10 or 0.15 ml) and % (2, 4 or 6 % of ear volume).

Max Reflex scale limit

Factory 0,15 ml **Range** 0,10 ml, 0,15 ml, 0,20 ml or 0,25 ml

Description Is used to select the scale of the ml axis of the reflex diagram.



Same Reflex in different scales. Figure 42

Stimuli Selection

Factory All frequencies are selected as factory setting

Range 250 Hz, 750 Hz, 1500 Hz, 3000 Hz, 4000 Hz, 6000 Hz, 8000 Hz, WN, LP and HP can be selected as On or Off.

Description Use the frequency keys to select the desired frequency and press Change (F1) to select "On" or "Off". Note! This item has influence on both ipsi and contra frequencies.

Ipsi frequencies: 500 Hz, 1000 Hz, 2000 Hz, 3000 Hz, 4000 Hz, WN, LP, HP.

Contra frequencies: 250 Hz, 500 Hz, 750 Hz, 1000 Hz, 1500 Hz, 2000 Hz, 3000 Hz, 4000 Hz, 6000 Hz, 8000 Hz, WN, LP, HP.

Autotest Max upper limit

Factory 110 dB **Range** From 90 dB to 110 dB in 5 dB steps.

Description Safety percussion to prevent the subject to get a higher output level than the level from this setup item during an impedance auto test measurement.

Default manual intensity

Factory 80 dB **Range** From 60 dB to 90 dB in 1 dB steps.

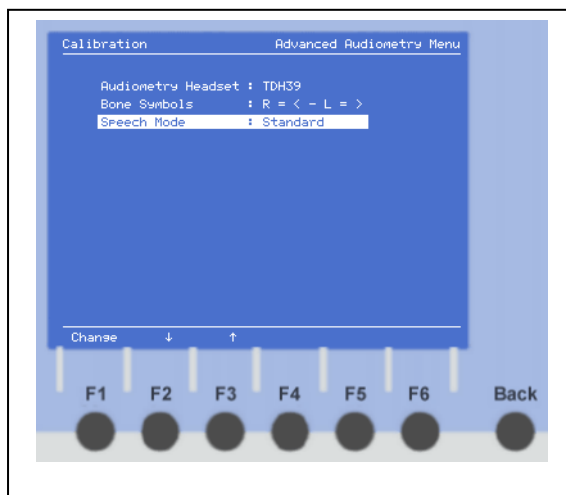
Description Start intensity level for manual impedance audiometry.

AGC for ipsi reflex stimuli

Factory Off **Range** On or Off

Description If ear volume is smaller than 2 ml the AGC (Acoustic Gain Control) for ipsi reflex stimuli will correct the level with the same level correction as for the AGC Probe tone control. The function will avoid too high levels in ear with smaller ear volumes. If the ear volume is higher than or equal to 2 ml the AGC Stimuli system will do nothing.

Advanced Audiometry User Setup



Advanced Audiometry Setup. Figure 43

Audiometry Headset

Factory TDH39 **Range** TDH39 or EAR 3A.

Description Selects what headset to be used in audiometry menus. Note that by choosing another transducer you may need to calibrate the transducer. The AA222 can hold calibration values for both transducers.

Bone Symbols

Factory R = < - L = > **Range** R = < - L = > / R = > - L = <

Description Selects how to display and print bone symbols.

Speech Mode

Factory Standard **Range** Standard or USA

Description Selects how to display speech information.

Letter Printout Error (Internal printer)

Some of the internal printer modules (thermo printer) can loose their font data and therefore do printouts with **errors** in the letters. If this error should occur please use this option to restore fonts in the internal printer module. Note! If not the internal printer option is selected in the Common menu this menu item will be invisible

Press Print (F6) in the Advanced User Setup and follow the instructions on the screen.

Note! Before restoring the fonts a jumper must be placed on the printer interface board connector J3, see Printer Connections for details.

Storing/Restoring the Setup



EEPROM Menu. Figure 44

The AA222 provides a tool for administrating the information stored in the setups. It can store, restore the setup and initiate to factory settings either from this EEROM menu or restore setup data trough a key press during power up.

When the setup of the instrument is done you can enter this menu and store all settings as an original setup. If a user changes in some setup items and cannot get the instrument to work properly afterwards ask the person to switch off power, hold down <shift>+<F4>, switch power on again and press "Yes" (F1) when the instrument asks you to restore setup to original setup. By doing so you bring the setup back to the settings you stored before you send it to the user.

You can also guide the user in to this EEPROM menu, but that requires you to tell the user the password.

Factory setting is our way of doing the setup.

Appendix AA222 U Update News

Following modifications are made for document number 80653110 instruments from serial 899714

New Main board PCA 51007615

Compatible to previous versions

Components modified for optimisation
Print Board Diagrams and BOM's removed

Accessories and spare parts update

Following modifications are made for document number 80653109 instruments from serial 851314

New Main board PCA 51007612

Compatible to previous version
PCA update for optimizing usage of components with various brands.

New Transducer board PCA 51010102

LED colour changed from Orange/Green/Blue to Red/Green/Blue

New ear tips introduced

Improvement of comfort level and sealing due to material change – new part numbers

Spare parts update

Following Improvements are made for document number 80653108 instruments from no.781654

New Main board complete assembled board PCA version 51007611 (PCB 69010807)

Compatible to previous version

C235 and R 162 are modified for improvement of print out and to prevent instrument reset during printout.

New version UPS400 Power supply 50000106

Following Improvements are made for document number 80653107 instruments from no. 755691

New Main board complete assembled board PCA version 51007610 (PCB 69010807)

Compatible to previous version

Optimisation of the pump driver IC77

Following Improvements are made for document number 80653106 instruments from no. 737822

New Main board complete assembled board PCA version 51007609

Compatible to previous version

Resistor R367 is modified to improve tolerance for flash programming